GeoTimes

Professional News Magazine

May–June 1959

Vol. III, No. 8

Published by the
American Geological Institute

Calendar

Cooperation of Society Secretaries in supplying meeting notices for GEOTIMES calendar is requested.

May 7-8, 1959—AIME: SOC. PETR. ENG., Permian Basin Sect. Oil Recovery Conf., Midland, Tex.

May 8-10, 1959—AIME: Uranium Local Sect., Moab, Utah. 4th Ann. Uranium Symposium.

*May 14-16, 1959—GSA, Rocky Mountain Section, Montana State University campus, Missoula, Montana. 3 field trips of Idaho batholith, pre-Cambrian strat. & Glacial Lake areas in vicinity of Missoula. Write: Wehrenberg at Univ. Guidebook.

May 14-23, 1959—INTERNATIONAL PETROLEUM EXPOSITION, Tulsa, Okla. For reservations write: IPE Housing Bureau, Oil Capital Bldg., Tulsa, Okla.

May 21-22, 1959—AIME: 13th New England Regional Conf., Statler Hotel, Hartford, Conn.

May 30-June 6, 1959—5th WORLD PETROLEUM CONGRESS, Permanent Council, New York. Write: C. E. Davis, Gen. Sec'y. 527 Madison Ave., New York 22.

June 11-12, 1959—IUCr. Commission on Crystallographic Apparatus, two conferences at Karolinska Institutet, Stockholm, Sweden. Inquire: Dr. William Parrish, Philips Laboratories, Irvington-on-Hudson, New York

June 15-17, 1959—SECOND SYMPOSIUM on X-Ray Microscopy & X-Ray Microanalysis, Stockholm. Inquire: Dr. G. Hoglund, Inst. f. Medicinsk Fysik, Karolinska Inst., Stockholm 60, Sweden.

Aug. 25-28, 1959—TENTH ALASKAN SCIENCE CONF. (AAAS), Juneau, Alaska. Geology Section Chairman, Charles V. Fulmer, Box 7-839, Anchorage, Alaska.

Aug. 24-30, 1959—5th CONGRESS OF THE INTERNATIONAL COMMISSION OF OPTICS, Stockholm, Sweden.

Aug. 30 - Sept. 12, 1959 — INTERNATIONAL OCEANOGRAPHIC CONGRESS, AAAS, UNESCO & ICSU special committee on oceanic research cooperating; United Nations Bldg., N.Y. Write: Dr. Mary Sears, Woods Hole Oceanographic Institution, Woods Hole, Mass.

Oct. 4-7, 1959—AIME: Soc. Petr. Engrs., Fall Mtg., Dallas, Texas.

Oct. 8-10, 1959—AAPG: SW Fed. of Geol. Soc's., 2nd Ann. mtg., Lubbock, Texas.

October 8-10, 1959—OPTICAL SOC. OF AMERICA, Ann. Mtg., Chateau Laurier, Ottawa, Canada.

Oct. 22-23, 1959—AIME: Los Angeles Basin Sect., Fall Mtg., Huntington Sheraton Hotel, Pasadena, Calif.

Oct. 27-29, 1959—AIME: Joint Solid Fuels Conf., Netherlands Plaza Hotel, Cincinnati, Ohio.

*Oct. 27-31, 1959—AAPG: Mid-Continent-Kans. Geol. Soc. Mtg., Broadview Hotel, Wichita. Two one-day field trips of Pennsylvanian and Permian rocks of south-central Kansas; write: Merriam, Univ. of Kans., Lawrence.

Oct. 29-30, 1959—AIME: Oil Recovery Symposium on SW Texas, Corpus Christi, Tex.

*Oct. 31-Nov. 7, 1959—GSA: Ann. Mtg., with Pittsburgh Geol. Soc., Pittsburgh, Pa. Two 3-day trips of Valley and Ridge and Appalachian Plateau; two 1-day trips of SW Penn. and central Penn. Write: Buckwalter, Univ. of Pgh., Pittsburgh. Guidebooks.

Nov. 9-12, 1959—SEGp: Ann. Mtg., Biltmore Hotel, Los Angeles, Calif. Jointly with Pacific Section of AAPG on Nov. 12.

Nov. 12-13, 1959—AAPG: PACIFIC SECT., Biltmore Hotel, Los Angeles, Calif. Jointly with SEGp on Nov. 12.

Dec. 12-13, 1959—OKLAHOMA ACAD. OF SCIENCE, Earth Science Sect., Ann. Mtg., Weatherford, Okla.

July 25-Aug. 6, 1960—IUGG: General Assembly, Helsinki, Finland. Inquire: Sec. Gen. G. Laclavere, 30 Avenue Rapp, Paris 7, France.

*Aug. 6-12, 1960—19th INTERNATIONAL GEOGRAPHIC CONGRESS, General Assembly of the IGU and meetings of the IGU Commission, Stockholm, Sweden. Inquire: The International Geographic Congress Postfack Stockholm 6, Sweden.

*Aug. 15 - 25, 1960 — XXI INTERNATIONAL GEOLOGICAL CONGRESS, to be held at the Mineralogical Geological Museum of the University of Copenhagen in Denmark. Field trips before and after the meetings.

1959 SCHEDULE OF FIELD TRIPS

For additional field trips held in conjunction with meetings, see those items marked with an asterisk under meeting calendar.

May 7-9—MISSISSIPPI GEOL. SOC., field trip to study Upper Cretaceous outcrops of NE Miss. & NW Ala.; write MGS, Box 2253, Jackson, Miss. Guidebook.

May 8-9—NEW YORK STATE GEOL. ASSOC., trip to Mid Devonian of central New York. Write: Cole, Cornell Univ., Ithaca. Guidebook.

May 8-9—CORPUS CHRISTI GEOL. SOC., field trip to Miocene through Edwards fm. of SW Texas. Write: Box 1068, Corpus Christi.

May 8-9—KENTUCKY GEOL. SOC., Annual Spring field trip, Nelson and adjoining co's, Ky.

May 9—SAN JOAQUIN GEOL. SOC., field trip to study Miocene and older Tertiary on west side of San Joaquin Valley; write T. A. Roy, Box 193, Bakersfield, Calif.

May 9-10—MIDWEST FRIENDS OF PLEISTOCENE, field trip of Pleistocene & pre-Cary of west-central Wisconsin. Write: Black, Univ. of Wisconsin.

May 15-17—FIELD CONF. OF PENN. GEOL., field trip of glacial geology of Erie & Crawford co's. Write: Lytle at 300 Liberty St., Pittsburgh 22. Guidebook.

May 16—ILLINOIS STATE GEOL. SURV., trip to Wilmington area of Will, Kankakee & Grundy Counties, Illinois.

May 16-17—FRIENDS OF PLEISTOCENE GEOLOGY 22nd Meeting: Wisconsin stratigraphy between London and Lake Erie, Univ. of Western Ontario, London, Ont., Canada.

May 20-23—PANHANDLE GEOL. SOC., field trip of struct. & stratig. of NE New Mexico & Raton Basin. Write: Carver, Box 2473, Amarillo, Tex. Guidebook.

May 22-24—ILLINOIS GEOLOGICAL SURVEY, field trip to faulted structures of SE Illinois in Gallatin and Hardin counties to study Penn., Miss., and Dev. rocks and fluorospar mining; write Podolsky, Box 180, Fairfield, Illinois. Guidebook.

June 12-14—MICHIGAN BASIN GEOL. SOC., field trip to Mackinac Island, Mackinaw City area and Rogers City quarry.

Aug. 12-15—BILLINGS GEOL. SOC., field trip of Sweetwater arch & disturbed belt near Great Falls and Helena, Mont. Write: Busby, Box 1836, Billings. Guidebook.

Sept. 9-11—WYOMING GEOL. SOC., group field trips to Big Horn Basin, Wyo. Write: Leverett, Box 875, Thermopolis. Guidebook.

Sept. 10-12—ALBERTA SOC. OF PETR. GEOLOGISTS, 9th Field Conference. Technical session Sept. 10, trip to Moose Mountain Sept. 11, trip to Drumheller Sept. 12.

Sept. 10-12—IAPG: field trip and camp out in Wasatch-Uinta Mtns. area of Utah. Write: John Osmond, Box 34, Salt Lake City, Utah.

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This Month in GeoTimes

Professional News Magazine

Published by THE AMERICAN GEOLOGICAL INSTITUTE

Robert C. Stephenson, EDITOR

Kathryn Lohman, CIRCULATION MANAGER

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GEOTIMES is published eight times a year by the American Geological Institute at Williams and Heintz Lithograph Corporation, Washington, D. C. Address all correspondence to 2101 Constitution Ave., N.W., Washington 25, D. C.

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Depletion

The April 15, 1959 issue of *Forbes* features a five-page story on *The Coming Battle Over Depletion* (pp. 17-21). They lead off by saying, "Neither doctrinaire argument nor cool logic is likely to decide the oil industry's most fateful question: survival of its famed 27½% depletion allowance. Instead the battle shaping up is likely to be won or lost on a practical question: how to raise more tax resources to fund prospective federal deficits."

Why should geologists-geophysicists as a profession be concerned over an issue which is loaded with political overtones? Is it a problem to worry the geology profession, the research lab boys and the state survey men? If you think not, then it might be well to review the economics of the profession.

Approximately three-quarters of all geologists-geophysicists are employed by industry to conduct exploration for petroleum and mineral resources. The welfare of this segment of our profession fluctuates with the very sensitive barometer of supply and demand which is influenced by many forces including reserves, cost of obtaining reserves, markets and international affairs. The remaining quarter is made up primarily of the educators, who train talent for exploration activities, and the state and federal survey personnel, who in many instances are engaged in basic studies in support of the nation's exploration for resources. The strength of any segment of our profession depends on the strength and health of the profession as a whole, so if something affects a substantial segment of our profession, it indirectly affects us all.

Depletion allowances and exploration risk capital are intimately related in most instances, so the livelihood of our profession is concerned with depletion allowances and what may happen to them.

As the scientists who best know that petroleum and mineral deposits are non-renewable resources we could—if we would—do much to educate the general public to the fact that oil in the ground and ore in a mine is capital and that each unit produced depletes this underground capital. Once people understand that depletion allowances are provided to offset loss of capital assets there will be far fewer loud cries about depletion being a tax dodge.

Do we care about the fate of depletion allowances? We ask you.

OUR COVER

Valley in Mesozoic and early Tertiary sediments, La Oroya, Peru, location of Cerro de Pasco smelter. *Photo by courtesy of G. C. Amstutz, Mo. School of Mines.* *(See page 32)*

The AMERICAN GEOLOGICAL INSTITUTE is a non-profit professional service organization established and managed by the scientific societies in the fields of geology and geophysics in cooperation with the National Academy of Sciences-National Research Council. It is the instrument of the profession serving and advancing the welfare of the geoscientist in matters relating to education, professional responsibilities and government relations. It is an active member of the Scientific Manpower Commission. It also functions in the stimulation of public education and awareness of the earth sciences, through career literature, the scouting program and other channels of communication.

GEOTIMES is the news magazine of the geological sciences. It reports on current events in the earth sciences, public education and public relations efforts throughout the profession, as well as appropriate legislative and governmental issues. It announces scholarships, fellowships, publications and new developments. It provides a forum for discussion of timely professional problems, and affords a common bond between the many specialized groups within the earth sciences

DATING OF MINING CAMPS

with

Tin Cans and Bottles

by CHAS. B. HUNT[1]

Old mining camps, ghost towns, in fact most abandoned habitations, arouse general curiosity and interest. People visiting such abandoned places soon begin poking around for relics and enjoy imagining the way life once went on there. Part of the fun is guessing when a place was occupied, when it was abandoned and why. This can have practical applications too, such as in the study of a mining district to learn whether the periods of activity correlate with the swings in the economic cycle or with the type and grade of ore being mined or prospected.

A favorite means of arriving at the dates is to uncover the layers of old newspapers or magazines that frequently were used to help insulate log cabins and other frame buildings. But approximate dates also can be obtained by observing the litter in the camp dump, more respectfully known by archeologists as the midden. The design or style of most commonplace articles and methods of manufacturing them have evolved greatly in the past hundred years so that such articles as tin cans and bottles can be useful for dating.

In the western United States most of the mining camps and ghost towns are less than 100 years old, and four ages of habitations can readily be distinguished by observing the accumulated litter. The oldest camps, those active before about 1900, are characterized by soldered tin cans, by beer bottles with hand finished necks made for cork stoppers, and by square nails.

Mining camps of the period from 1900 to World War I are characterized by round nails and by bottles with hand-finished necks, but by this time the beer and soft drink bottles were being made to accommodate metal caps instead of cork stoppers. Soldered tin cans continued in use throughout this second period.

The third period includes the 20's and early 30's. At camps of this period the bottles have machine-finished necks and the tin cans are crimped instead of being soldered, and these artifacts are associated with miscellaneous car parts including that familiar Ford monkey wrench known as "the knuckle breaker".

The latest period, the last 20 years, has been the era of the beer can associated with aluminum cooking utensils.

Tin cans and bottles are so uniform and commonplace today it is difficult to realize that only half a century ago the methods of manufacturing both were primitive. Figure 1 illustrates the contrast between the old type soldered tin can and the modern type having crimped ends which was manufactured after World War I. In the eleventh edition of the Encyclopedia Brittanica (v. 26, p. 1000), published before the new manufacturing method was adopted, we learn that in Great Britain tin cans for preserving foods began to be manufactured in quantity about 1834, and that large quantities were shipped to the United States until about 1890, when domestic production began expanding greatly. The old method for manufacturing "tinned cans" is described as follows (v. 10, p. 613):

"The canister, which has been made either by the use of solder or by folding machinery only, is packed with the material to be preserved . . . the lid is secured by soldering or folding. Sterilization is effected by placing the tins in pressure chambers, which are heated by steam to 120° C. or more . . . Sometimes a small aperature is pierced through the lid, to allow the escape of the expanding air, such holes before cooling closed by means

[1] Geologist, U. S. Geological Survey, Denver, Colo.; Former Executive Director, American Geological Institute.

of a drop of solder. This process . . . is employed on an enormous scale, especially in America".

The old type tin can was not altogether satisfactory for the account goes on to state that there was a distinct limit to the length of period of preservation of canned food, and that the use of tin plate for preserving acid substances like tomatoes and peaches was highly objectionable.

About the time of World War I, however, methods of manufacturing tin plate and methods of sterilizing foods in cans were greatly improved, and these changes in manufacturing methods are recorded in mining camps by the appearance of tin cans having crimped ends and no soldering (fig. 1).

Finally, during the 30's the modern beer can arrived with its characteristic triangular openings and brightly colored printing.

The manufacture of glass is one of the oldest industries, dating back several thousand years before the Christian Era, and may have begun by fusing sand and soda in an open fire. Not until the beginning of the Christian Era, when the blowpipe was invented, were means found for producing clear, or crystal glass (Phillips, 1941, p. 7). By the end of the third century window glass was being made (Phillips, 1941, p. 8). In this country glass manufacture is believed to have been the first industrial enterprise undertaken in the colonies. A factory making bottles and glass beads for trading with the Indians was established at Jamestown in 1607 or 1608 (Phillips, 1941, p. 16; Silverman, 1954, p. 143). But as late as 1900 the methods of manufacturing glass were not basically different from the methods that had been used during the preceding 1500 years (Phillips, 1941, p. 19).

One of the most easily recognized changes in bottle styles occurred about the time of World War I, along with the change in method of manufacturing cans. Before that time the necks of bottles were finished by hand; after that time they were finished by machine (fig. 2). In the modern machine-finished bottle, the seams from the mold extend the whole length of two sides and even across the lip of the neck. Prior to World War I the necks were finished by hand, and the seams on bottles made during earlier periods end at the base of the neck which is a layer of glass wound around the partly finished bottle. The hand process of bottle manufacture has been described as follows (Powell and

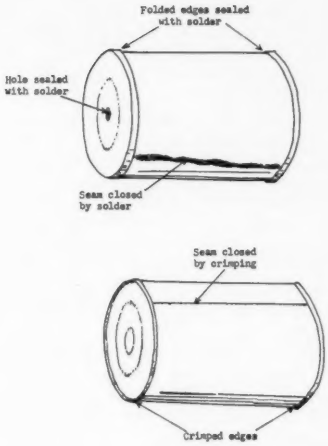

Figure 1. Old type tin can (above) and modern type with crimped seam and ends.

Figure 2. Old type bottles with hand finished necks (left) have mold seams ending at the neck, commonly in a curve. On machine finished bottles (right) the seam extends to the top.

Rosenhain, 1910, p. 95; see also Thorpe, 1912, p. 730):

"A bottle gang . . . consists of five persons. The "gatherer" gathers the glass from the tank furnace on the end of the blowing-iron, rolls it on a slab of iron or stone, slightly expands the glass by blowing, and hands the blowing iron and glass to the "blower". The blower places the glass in the mould, closes the mould by pressing a lever with his foot, and . . . blows down

the blowing iron . . . When the air has forced the glass to take the form of the mould, the mould is opened and the blower gives the blowing iron with the bottle attached to it to the "wetter off". The wetter off touches the top of the neck of the bottle with a moistened piece of iron and by tapping the blowing iron detaches the bottle and drops it into a wooden trough. He then grips the body of the bottle with a four-pronged clip, . . . and passes it to the "bottle maker". The bottle maker heats the fractured neck of the bottle, binds a band of molten glass round the end of it and . . . shapes the inside and outside of the neck. . . . The finished bottle is taken by the "taker in" to the annealing furnace. . . .

"The processes of manipulation which have been described, although in practice they are very rapidly performed, are destined to be replaced by the automatic working of a machine."

The change to machine methods had been anticipated by the invention of the Owens bottle machine about 1900 (Silverman, 1926, p. 897), and machine-made bottles began reaching mining camps in quantity after World War I.

An earlier change in bottle style occurred about 1900. During the nineties and earlier, beer and soft-drink bottles were made to receive cork stoppers, but after 1900 they were made to receive metal caps (fig. 3).

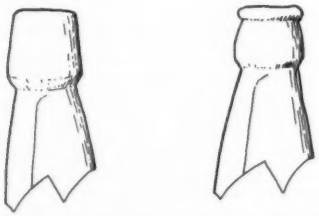

Figure 3. Neck of pre-1900 beer bottle, made for cork stopper (left); after 1900 beer bottles and soft drink bottles were made for metal caps (right). Both these necks were hand finished.

The color of glass fragments scattered about abandoned mining camps can also be helpful in determining the period of occupancy. Camps active before World War I are characterized by abundant purple fragments whereas camps younger than World War I generally have little purple glass, and a high percentage of clear glass. The purple glass at old mine camps originally was clear, but exposure to sunlight causes photochemical changes in the manganese oxide in the glass and these changes cause the purple coloring (Alway and Gortner, 1907, p. 4-7; Gortner, 1908, p. 157-162; Lucas, 1922-23, p. 72-73; Hoffman, 1937, p. 229, 3649). When glass manufacture was largely by hand the manufacturer could adapt the process to the material at hand, but when the methods became mechanized the materials had to be adapted to the process, and less variation in composition could be allowed. Since the advent of machine-made bottles, about the time of World War I, the materials used in making glass have contained fewer impurities that would change the color of the glass.

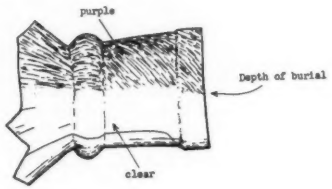

Figure 4. Rim of old jar with hand finished neck that was partly buried and partly exposed. The exposed part is purple; the buried part remained clear.

That the purple color in old glass is due to manganese oxide in the glass has been shown by numerous chemical analyses (see for example Alway and Gortner, 1907; Gortner, 1908; Lucas, 1922-23; Hoffman, 1937). Invariably purple glass contains high percentages of manganese—more than 0.1 percent and in some examples as much as 1.0 percent. The intensity of the color is correlative with the manganese content.

That the purple color also is due to exposure has been demonstrated by a number of experiments in which some glass was partly covered with paint and exposed to sunlight. When the paint was removed the exposed part was colored whereas the protected part was not (Rosenthal, 1917, p. 734). One can satisfy himself that this is so by finding glassware partly buried in the ground; the part that was buried remains clear while the part that was exposed has become purple (Simpson, 1905, p. 236; Alway and Gortner, 1907, p. 5, 6) (fig. 4). The color change is by no means peculiar to deserts and high altitudes; it

(Continued on page 34)

COMMITTEE OF 1000 FOR AGI – 1959

Membership Approaches 300

More than 150 GeoTimes readers listed below have recently added their support to AGI and GeoTimes through their contributions of $10 or more to the Committee of 1000 for AGI–1959, thus swelling this committee membership to 272. Lists of earlier contributors were published in previous issues of GeoTimes. The contributions of this growing group of geoscientists is providing a substantial segment of the funds needed to meet the anticipated deficit in Institute operations.

In addition to these Committee of 1000 contributors 553 individuals have contributed amounts less than $10. An envelope to facilitate mailing contributions can be found in the March issue of GeoTimes. If you have not contributed to AGI and GeoTimes, we urge you to do so.

Your aid to AGI will help AGI to work for you.

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For previous lists of members of the Committee of 1000 for AGI–1959, see GeoTimes Jan.-Feb., p. 22; March, p. 17, and April, p. 17.

I. C. WHITE
pioneer petroleum geologist

PAUL H. PRICE [2]

Israel Charles White was born near St. Cloud in western Monongalia County, West Virginia, on November 1, 1848. He was of English descent. His first American ancestor, Stephen White, arrived in Baltimore County, Maryland, in 1639. His father, Michael White, was one of a pioneer family of eleven children.

In the "fifties" of the 19th century, the educational facilities in West Virginia were meager, to the extent that Dr. White's early education was obtained largely at short sessions of school supported by private subscription. At about the age of 20 he entered West Virginia University at Morgantown with the idea of becoming a physician and surgeon. Shortly after his entrance in the university he assisted a local physician in performing an autopsy on a man in a mountaineer home near Morgantown, when the only tool available for the purpose was a hand saw. The physician was an elderly man and the burden of the task fell on Dr. White and this experience so disgusted him with the medical profession that he then and there decided to fit himself for some other branch of scientific endeavor.

He graduated with highest honors from West Virginia University in 1872, getting the degree of A.B. and three years later the degree of A.M. and in 1922 the degree of L.L.D. All from the same institution. On the date of his death he was the oldest living graduate of West Virginia University. In 1880 the University of Arkansas awarded him the degree of Ph.D., and in 1922 the University of Pittsburgh, the degree of D.Sc.

While in West Virginia University, Dr. White studied geology under the late Dr. John J. Stevenson, one of the most eminent geologists in America and one who, after leaving West Virginia University, became professor of geology at the University of New York with which he was actively connected for more than 30 years. It was the talented teaching of Dr. Stevenson that created the desire in Dr. White to change from the profession first contemplated to that of a geologist.

His first practical work in geology began in 1875 when he was appointed field aid to Dr. Stevenson on the Second Geological Survey of Pennsylvania. Here he made rapid progress and was made full assistant geologist on the same survey in 1876, which position he held until 1883. During this period he prepared eight volumes of reports on the geology of counties of northwestern Pennsylvania. Although he covered a large area there in a limited time, yet the data presented in these reports or volumes were collected and analyzed with greatest care, and this taken in conjunction with their essential pioneer character has caused them to become invaluable for reference purposes.

From 1884 to 1888 he was assistant geologist on the staff of the United States Geological Survey. During this period he accumulated the data in the field and wrote Bulletin 65 (U.S. Geological Survey) entitled "Stratigraphy of the Appalachian Coal Field" dealing mainly with the coal fields of Pennsylvania and West Virginia and laying the foundation for subsequent geological work in those states.

In 1882 he promulgated what is known as the "Anticlinal Theory of Oil and Gas Accumulation" and demonstrated the important part played by gravity in conjunction with anticlinal and dormal types of geologic structure in the segregation of oil and gas into commercial pools. Previous to this time half formed ideas existed in the

[1] Reprinted from the Compass of Sigma Gamma Epsilon, Vol. 35, No. 3, March 1958, pp. 149-153.

[2] State Geologist, West Virginia Geological Survey, Morgantown, West Va. Member, AGI Board of Directors representing Association of American State Geologists.

minds of a few men but no authoritative discussion of these ideas had been made. His theory was published in "Science" under date of June 26, 1885. His advancement of this theory, as a scientific fact, brought a prolonged discussion and criticism on the part of other geologists. He not only maintained his side of the controversy but by a close study and application of the theory to the potential oil and gas fields in wildcat areas of West Virginia and Pennsylvania, was enabled to make investments in oil and gas lease holds which resulted so successfully that they not only proved his anticlinal theory but gained him a comfortable fortune thus enabling him to indulge to a much greater degree in scientific pursuits.

Dr. White was professor of geology at West Virginia University from 1877 to 1892, devoting his summer vacation periods to active work in the field on his Pennsylvania survey engagements. At the University his teaching was marked by its practical character and geology under him became a live study. However, his business and professional work increased to the extent that he was compelled to give up his teaching in 1892.

In 1897 the Legislature of West Virginia established the West Virginia Geological Survey, Dr. White being absent from the country at the time as a delegate from the Geological Society of America to the meeting of the International Geologic Congress at St. Petersburg, Russia. Without waiting to consult him on his return, the State Geological Survey Commission immediately appointed Dr. White as State Geologist, which position he held until his death. This was the endeavor closest to his heart. He contributed 30 years of devoted work to establishing this agency which has contributed so much to the development of the mineral industry of the State. He early realized the need for accurate topographic maps and under his competent guidance and with the cooperation of the federal government he was able to furnish a complete set of topographic maps for the entire State. This was one of the earliest states to complete this work. He also supervised the preparation of, and edited, thirty-four geologic reports or volumes for the state, of which he himself was the author of five.

In 1904, Dr. White received the highest recommendation to the Brazilian Government authorities as one being peculiarly well fitted to make a report that might interest foreign capital in the development of the coal fields in the four southern

(Continued on page 35)

Symposium of Geochemistry

Gottingen, Germany
August 21-22, 1959

A symposium on geochemistry organized by the Commission on Geochemistry of the International Union of Pure and Applied Chemistry, will be held in Göttingen, Germany, on August 21st and 22nd, 1959, to be followed by two days' field excursions. Following are the topics for discussion at the Symposium and the keynote speaker for each topic:

- STABLE NUCLIDES IN GEOCHEMISTRY —*K. Rankama*
- LONG LIVED RADIONUCLIDES IN NATURAL SYSTEMS—*Harrison Brown*
- GEOCHEMISTRY OF THE HALOGENS—*C. W. Correns*
- GEOCHEMICAL ASPECTS OF LIFE ON EARTH—*Oparin and Harold Urey.*

These keynote speakers will extend invitations for further contributions.

The excursions will comprise a day's visit to the Harz and another one to the Zechstein salt deposits along the Werra.

Further information may be obtained from the local chairman of the Symposium, *Professor C. W. Correns, Sedimentpetrographisches Institut, Göttingen, Lotze strasse 13.*

U. S. ANTARCTIC RESEARCH PROGRAM

Established by
National Science Foundation

Albert P. Crary, geophysicist, an active member of the U. S. National Committee for the IGY, was recently selected by the National Science Foundation to serve as Chief Scientist in the Foundation's new Antarctic Research Program. Crary only recently returned from 2½ years in Antarctica where he was Station Scientific Leader of the Little America IGY program. The new NSF program will seek to coordinate the scientific efforts of Federal agencies with an interest in Antarctic research and to receive proposals from university scientists and independent investigators for polar research. Liaison is to be maintained with the Committee on Polar Research of the National Academy of Sciences. Geophysicist Crary will continue his association with the Geophysics Research Directorate, U.S.A.F. Cambridge Research Center.

GEOLOGY IN HIGHWAY ENGINEERING

A variety of applications of geology was demonstrated at the Tenth Annual Symposium on Geology as Applied to Highway Engineering, held February 20 at Georgia Institute of Technology in cooperation with the State Highway Department of Georgia. Mr. W. T. Parrott, Highway geologist of the Virginia Department of Highways, presided while eight papers were presented in which the utilization of geologic knowledge ranged from resolution of legal aspects to the practical finding of good foundations and low-cost material for aggregate.

The application of geomorphology in engineering was discussed by Mr. Donald J. Belcher, president of Donald J. Belcher Associates, Ithica, whereas Mr. George D. Felix, engineer of the Virginia Department of Highways, gave some surprising examples in which geology was an aid in determining right of way. Mr. G. A. Fletcher, assistant vice-president of the Raymond Concrete Pile Company, showed how geology is used in foundation engineering, and some unusual subsidences of embankments on deposits of peat and soft organic clays in areas of glacial drift were described by Mr. Harry E. Marshall, engineer-geologist of the Ohio Department of Highways. The value of statewide aggregate surveys as an aid to highway construction was stressed by Mr. Ralph W. Seeger, engineer-geologist at the Engineering Experiment Station of West Virginia University. The relationship of geologic considerations to drainage structures was pointed out by Mr. John M. Robertson, chief sales engineer of the Armco Drainage and Metal Products Company.

The differences that the geology of the various regions make in causing and in helping to solve problems in highway engineering in his home state was covered by Dr. A. S. Furcron, chief geologist of the Georgia Department of Mines, Mining and Geology. Mr. Charles M. Upham demonstrated the use of geological investigation in foreign consulting work.

The local sponsoring committee consisted of Mr. W. F. Abercrombie, materials engineer for the Georgia State Highway Department; Mr. C. A. Bergey, assistant engineer of the U. S. Bureau of Public Roads; Dr. J. G. Lester, professor of geology at Emory University; Dr. D. A. Mitchell, geologist of the Georgia State Highway Department; Professor R. S. Paquette of the civil engineering department; Professor H. N. Straley of the geology department of Georgia Institute of Technology; and Dr. Furcron.

The symposium provides a forum for a valuable exchange of ideas between those concerned with interests common to both geology and highway engineering. This need was envisioned by Mr. Parrott when under the stimulus of his leadership the first symposium was held in 1950 at Richmond. The second symposium was again in Richmond, and successive ones prior to this year were held at Lexington (Va.), Charleston (W. Va.), Columbus (Ohio), Baltimore, Raleigh, State College (Pa.), and Charlottesville.

The sponsorship is by a steering committee consisting of Mr. Parrott as chairman; Mr. P. H. Bird, senior geologist of the New York Department of Public Works, as vice-chairman; Mr. H. D. Chase, soils engineer of the Georgia State Highway Department, as secretary; and Dr. Paul Price, state geologist of West Virginia; Mr. H. H. Harris, assistant chief engineer of the Virginia Department of Highways; Mr. R. H. Nesbitt, chief geologist of the Corps of Engineers; Dr. Jasper Stuckey, state geologist of North Carolina; and Mr. F. C. Witowski, director of research and testing, Pennsylvania Department of Highways.

Meetings are well attended, and their scope is constantly broadening. Copies of the papers presented are distributed free. No registration or other fees are required. Those wishing to be advised of the date, place, and the program of the meeting next February may indicate their interest to *Mr. W. T. Parrott, Department of Highways, 1221 E. Broad St., Richmond 19, Va.*

Geologist Wins Chemical Award

Dr. John A. Wood, Jr., of Jacksonville, Florida, has been awarded a post doctoral fellowship for the academic year 1959-1960 from the Petroleum Research Fund of the American Chemical Society. Wood graduated in geology from Virginia Polytechnical Institute in 1954 where he received the Holden Prize in Geology. He later held an NSF Graduate Fellowship at MIT, where he received his Ph.D. in 1958. He will continue research studies at Cambridge University, England, in the area of basic geophysics.

EARTH SCIENCE RESEARCH CENTER

Proposed for M.I.T.

Plans are well advanced for an integrated instructional and research program in the earth sciences at M.I.T. A recent gift of $2,500,000 from Mr. and Mrs. Cecil Green of Dallas, Texas, will provide a multi-story building which will house a Center for Earth Sciences. Additional funds are being sought for the most modern equipment and facilities to go into the building, and to support the instructional and research activities of the Center. The Center will have the use of the Nuclear Reactor and the I.B.M. 704 Digital Computer, as well as a large number of other M.I.T. facilities, and will cooperate closely with the Woods Hole Oceanographic Institution.

Students in mathematics, physics and chemistry, in chemical, civil and electrical engineering, and in the geosciences (geology, geochemistry and geophysics) will be encouraged to enter the program and do their graduate work on some aspect of earth science such as meteorology, oceanography, or the geosciences. All students will have in common a thorough preparation in mathematics, physics and chemistry as a foundation on which to base their graduate work.

Graduate students wishing to do a theoretical thesis will be invited to work with a closely cooperating group of mathematicians, physicists, meteorologists, oceanographers and geophysicists; those wishing to do an experimental thesis will find available up-to-date equipment, facilities, and supervision. Students desiring to do field theses will be encouraged to use the facilities of Woods Hole for oceanographic research, those of the M.I.T. Department of Meteorology for atmospheric research, and those of the Department of Geology and Geophysics for geological, geophysical or geochemical work. Thesis research in interdepartmental and interdisciplinary fields is already quite common and will be encouraged for all students judged competent to work in more than one field.

Mr. and Mrs. Cecil H. Green (above) recently made a gift of 30,000 shares of Texas Instruments, Incorporated, stock valued at $2.5 million on March 31 to the Massachusetts Institute of Technology to be used for construction of an earth sciences research center. Mr. Green, Vice President of Texas Instruments and Honorary Chairman of the Board of the subsidiary company, Geophysical Service, Inc., is a graduate of MIT '23. Mr. Green joined GSI in 1930 shortly after it was formed and was one of its first seismograph party chiefs. Having devoted his entire career to the practical aspects of the earth sciences, Mr. Green said that he and Mrs. Green regard their gift as the most suitable means at their command to extend and enrich the basic knowledge upon which all such practical effort and activity must be based.

Students now registered in the program may receive master's or doctor's degrees in any of the earth sciences. In each case a special guidance committee is organized for the degree candidate, and the members of this committee work closely with him throughout his graduate work.

The ultimate product of this integrated program is expected to be a well-grounded physical scientist with some knowledge of the principal earth sciences and special knowledge of at least one of these. Graduates thus far produced have met these specifications, and it is expected that the numbers of degree candidates will increase substantially when the Center is in full operation. As present, about 100 graduate students are registered in the earth sciences at M.I.T.

GEOLOGY-GEOPHYSICS STUDENTS IN UNITED STATES AND CANADA IN 1959

	Colleges Queried	Colleges Responding	Total Geology-Geophysics Students	No. in Geology	No. in Geophysics	Per Cent Undergrad.	Per Cent in MA Program	Per Cent in PhD Program
				UNITED STATES				
1959	222	220	10,217	9,707	510	68.6	21.0	10.4
Change in 1959	5.7%	6.3%	2.0%	-1.1%	34.2%			
1958	210	207	10,197	9,817	380	72.84	18.19	8.97
1957	207	204	9,439	9,145	294	72.96	18.23	8.81
1956	205	194	8,093	7,765	328	72.06	18.26	9.68
				CANADA*				
1959	18	18	868	784	84	74.2	16.6	9.2
Change in 1959	12.5%	12.5%	15.9%	13.3%	47.4%			
1958	16	16	749	692	57	74.77	14.15	11.08
1957	16	16	594	560	34	72.90	16.83	10.27

*Not surveyed in 1956.

TABLE 1. A summary and comparison of the 1959 total student enrollment in geology and geophysics in colleges and universities of Canada and the United States with the previous years, 1956-58.

Some significant trends are apparent in student enrollment in courses of geology-geophysics in the colleges and universities of Canada and the United States as revealed by the preliminary results of the annual survey conducted by the American Geological Institute. A more detailed report will be published later in the year in the 1959 Edition of AGI Report 12 *"Survey of Geology-Geophysics Students in the Colleges and Universities of the United States and Canada."*

In the United States for the first time since the survey was started in 1956, the total number of junior majors in geology-geophysics fell below the number of graduating seniors. The number of graduating seniors in 1959 indicates a levelling-off in geology enrollments after a number of years of steady rise. Informal communications from several large schools indicate that freshman-sophomore enrollment of students intending to major in geology is off sharply. There is little question but that this drop in enrollment reflects the poor employment outlook which has prevailed in the past two years with the cut back in exploration for petroleum and mineral resources.

At the graduate level, enrollment continues to show steady increase, with enrollment in the master's program up 15.4

	GEOLOGY					GEOPHYSICS				
	1959	% Change In 1959	1958	1957	1956	1959	% Change In 1959	1958	1957	1956
					UNITED STATES					
Undergraduate										
Seniors	3503	-2.3	3511	2928	2269	142	54.3	92	54	58
Juniors	3262	-12.4	3722	3819	3421	104	1.0	103	86	84
MA										
Candidates	1983	12.7	1760	1644	1391	157	67.0	94	76	87
PhD Program										
Degree Year	205	3.5	198	167	150	25	8.7	23	23	20
Int'med. Year	440	16.1	379	374	305	63	50.0	42	49	52
First Year	314	27.1	247	213	229	19	-26.9	26	6	27
Total Enrollment	959	16.4	824	754	684	107	17.6	91	78	99
					CANADA*					
Undergraduate										
Seniors	272	17.7	231	182		31	210.0	10	5	
Juniors	316	8.6	291	232		25	-10.7	28	14	
MA										
Candidates	131	37.9	95	91		13	18.2	11	9	
PhD Program										
Degree Year	29	-3.3	30	17		7	133.3	3	2	
Int'med. Year	19	-9.5	21	20		4	100.0	2	3	
First Year	17	-29.2	24	18		4	33.3	3	1	
Total Enrollment	65	-13.3	75	55		15	87.5	8	6	

*Not surveyed in 1956

TABLE 2. A summary and comparison of 1959 student enrollment in geology-geophysics at various academic levels in colleges and universities of Canada and the United States with that of previous years.

per cent over last year and in the doctor's program, 16.5 per cent.

Eleven departments more than in 1958 have reported geophysics majors in 1959 and enrollment in geophysics appears to be up at all academic levels in both Canada and the United States.

In Canada, two additional departments were added to the survey in 1959, bringing the total to 18. There was a slight over-all increase in geology-geophysics enrollments in Canada and there was a levelling-off, but no decline in enrollment at the junior class level.

Tables 1 and 2 and Figures 1 and 2 present the salient preliminary data. It should be pointed out that these data are collected in January of each year from department heads. They do not agree, therefore, with the statistics of the U. S. Office of Education which are based on

(Continued on page 32)

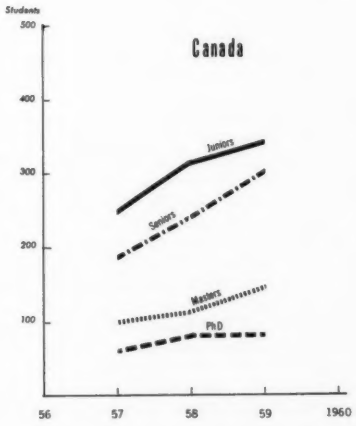


FIGURE 1. Graph showing trends in enrollment of geology-geophysics students at various academic levels in colleges and universities of Canada in the years 1957 to 1959.

REVIVAL OF GEOLOGY IN PENNSYLVANIA HIGH SCHOOLS

by JOHN H. MOSS[1]

Five years ago, nothing could have been more moribund than the status of geology in Pennsylvania high schools. Today, the patient is sitting up, taking nourishment and showing signs of a healthy future. Although geologists had little to do with the all-important decision to reintroduce geology and the other "earth sciences" into the curriculum, the story of how the decision has been implemented may prove of interest, particularly to those who would like to see more geology taught in public schools.

About a year ago, as part of its post-sputnik curriculum modernization program, the Pennsylvania Department of Public Instruction decided that it would be beneficial for all future citizens to learn more about the Earth on which they live and the realm of Space to which their future lives will be increasingly oriented. At the time, a smattering of geology, meteorology and astronomy was covered lightly in a series of 7th, 8th, and 9th grade general science courses. The new idea called for a consolidation and expansion of this material into a one-year-long "long pants" science course.

There being no specialists in these areas in the Department, Dr. Lee Boyer, Scientific Consultant, organized a volunteer 14-man advisory committee to develop an Earth and Space science course embracing the principles of geology, meteorology, and astronomy. Four geologists: J. Donald Ryan, Lehigh; Charles Thornton, Penn State; Alan Geyer, Pennsylvania Geological Survey, and the author were appointed, along with 3 astronomers, 1 meteorologist, 1 space scientist, 1 geographer, 1 conservationist, 1 earth scientist and 2 high school teachers. A subcommittee of 2 geologists, 2 astronomers and 1 meteorologist set about developing the course philosophy and preparing the syllabus. Although very green in this field the subcommittee studied many possibilities and then agreed on the following ideas about the course. First, the original syllabus should be pitched for gifted college-bound students and later adapted to less talented classes (not the reverse as is too often the case). Secondly, the identity of the disciplines of geology, meteorology, and astronomy should be maintained (not an integrated course), although the relationship between the three disciplines should be clearly spelled out. Thirdly, the teaching order: geology-meteorology-astronomy is probably the most logical because the student is taken from his known surroundings outward into space, and the sugar candy of the principles of space travel is saved until last. Fourthly, the student should be well exposed to uncertainties and unsolved problems in these sciences and be dissuaded from the idea that science already has solved most of the problems in these fields. Lastly, the student's curiosity should be stimulated by concentrating on explanations of natural phenomena not merely descriptions to be memorized.

Within the geology section, it was decided, because of students' natural interest in processes, to approach the subject through physical, not historical, geology. The sequence proposed, which seems logical, runs from the crust of the earth (rocks and minerals) to internal geologic forces (vulcanism, earthquakes and mountain building) to external processes (weathering and erosion) to a section on oceanography and finally to historical geology (the past record of these forces and processes). It is suggested that at least 13 weeks (65 class meetings in some schools) be spent on geology, 11 on meteorology, 8 on astronomy and 2 on an introduction showing in part the relation between the fields.

In nine months, the subject matter outline was completed and approved by the

[1] DR. JOHN MOSS is Associate Professor of Geology at Franklin and Marshall College, Lancaster, Pa. He is also Chairman of the Earth and Space Science Course Advisory Committee of the Pennsylvania Department of Public Instruction.

full committee and work is now under way on a teachers' guide to be published by the Department of Public Instruction this summer. Suggestions on teaching aids and other items for this manual will be gratefully received by the author.

During the course of our work we learned that anyone who believes that the writing of a course outline and teachers' guide is the most important part of establishing a new high school course is incredibly naive. Actually adding a course is a highly complex operation requiring the solution of a whole series of allied problems. Fortunately for us, Dr. Charles Boehm, Superintendent of Public Instruction, Dr. Paul Glatzert, Head of the Division of Curricular Services and Dr. Boyer all stoutly championed the cause of the course from the beginning and rapidly solved most of the problems connected with its inclusion in the curriculum. First, necessary approval of the course was obtained from the State Council on Education. Next, the Department provided a niche for it in the curriculum by recommending it as an alternative for 9th grade general science or as an extra high school science course. The knotty problem of equipping schools with necessary rocks, minerals, maps, a weather station, telescope and other equipment was met by designating the course as eligible for federal funds under the National Defense Education Act.

The problem of obtaining qualified teachers was attacked through rapidly establishing teacher certification requirements. However, a critical shortage of teachers with training in geology, meteorology and astronomy exists. Two of the state teachers colleges have added men with geological training to their staffs and some of the universities and liberal arts colleges of the state are well along in setting up programs to help solve the teacher shortage. Lehigh University and Franklin and Marshall College expect to apply for National Science Foundation Earth Science teachers' institutes for the summer of 1960 to retrain present science teachers. The all-important teacher problem, however, will not be solved easily or soon, and this may hamper establishment of the course.

Although many hurdles have been cleared, the big one of whether a sizable number of schools adopt the course is still ahead. If they do (there are 1800 high schools in the state), a healthy new demand for men with geological training may well develop in Pennsylvania. The Committee is presently seeking a qualified man to recommend to the Department of Public Instruction for the all-important full time job of helping the schools set up the course.

In retrospect, I would say that progress thus far in Pennsylvania has been greatly aided by a most fortunate combination of circumstances. First, from the beginning, the top men in the Department of Public Instruction gave the project their strong support. Secondly, the growing nationwide interest in space and space travel caused educators to want to learn about a course dealing with earth and space. Thirdly, at the time we appeared, Pennsylvania was expanding its science curriculum and looking about for new offerings. Lastly, the committee was willing to volunteer its services and to work tolerantly within the unfamiliar pattern of a Department of Public Instruction.

In conclusion I would like to suggest that the best aim of high school geology training is not to draw more students into geology but to provide an understanding of our field and its problems to a large number of students, irregardless of what their future field of specialization may be.

Earthquake Engineering Conference

Tokyo-Kyoto, Japan
July 11-18, 1960

The Second World Conference on Earthquake Engineering will be held at Tokyo and Kyoto, Japan, July 11-18, 1960. It is being organized by the Science Council of Japan in cooperation with the Japan Society of Civil Engineers, Architectural Institute of Japan and Seismological Society of Japan. The first Conference was held in Berkeley, California in 1956.

The Conference will be dedicated to consideration of recent advances in earthquake research and to the purpose of minimizing earthquake hazards through improved understanding and engineering practices.

It is planned to distribute preprints of all papers in English for distribution to Conference participants. Official languages of the meeting will be Japanese and English, with Japanese translated into English.

Registration will be 1,500 yen (about $4 U.S.). For further information write *Professor Kiyoshi Muto, Chairman, Organizing Committee, 2nd World Conference on Earthquake Engineering, Science Council of Japan, Ueno Park, Taito-ku, Tokyo, Japan.*

DULUTH CONFERENCE TAKES SHAPE

The Duluth Conference for teaching resources development in the geological sciences was first reported in the March issue of GeoTimes pages 14-15. The conference is a six-week workshop conference which will be held in Duluth, Minnesota, July 20-August 28 under the joint sponsorship of the University of Minnesota, Duluth Branch, and the American Geological Institute, with the aid of enabling grants from the National Science Foundation.

The Duluth Conference is an important part of a Teaching Resources Development Program in the geological sciences to stimulate improved teaching of the geological sciences at various levels in the school science programs. Program plans are being developed by a steering committee consisting of:

ROBERT L. HELLER, *Chairman*

C. E. DUTTON, U.S.G.S., Madison, Wisc.

P. E. FITZGERALD, Dowell Inc., Tulsa

L. K. LISONBEE, Science Supervisor, Phoenix (Ariz.) School System

R. W. MARSDEN, Oliver Mining Div., U.S. Steel Corp., Duluth

G. A. THIEL, Univ. of Minnesota, Minneapolis

G. M. WILSON, Illinois Geological Survey

C. J. ROY, *ex officio*, Chairman, AGI Education Committee

R. C. STEPHENSON, *ex officio*, Executive Director, AGI.

Mr. Lisonbee was recently added to the Steering Committee to represent the science teaching profession. He is active in the National Science Teachers Association.

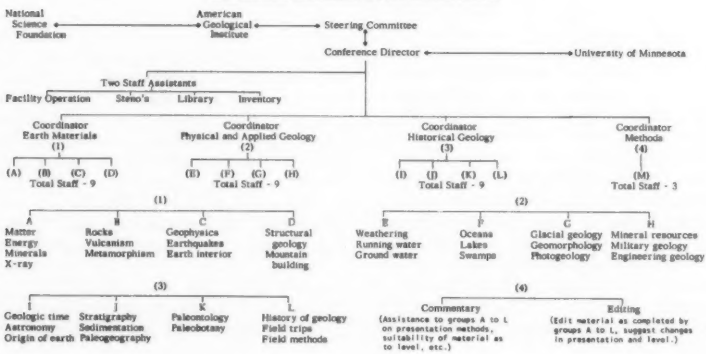
The Steering Committee has met four times to lay plans for the conference and to screen candidates. A flow diagram for the over-all operation of the Duluth Conference is shown as above and an organizational chart showing how the subject matter will be attacked is shown at the bottom of the page.

FLOW PATTERN OF DULUTH CONFERENCE FOR TEACHING RESOURCES DEVELOPMENT

The Steering Committee has found much interest and enthusiasm for the teaching resources development program as is evidenced by the fine roster of capable, well-qualified science teachers and professional geologists who have accepted invitations to participate.

Underway now is an inventory of existing teaching resource materials which will be assembled and catalogued in advance of the Duluth Conference. These will be

ORGANIZATION CHART FOR DULUTH CONFERENCE FOR TEACHING RESOURCES DEVELOPMENT



DULUTH CONFERENCE PARTICIPANTS

GROUP I. SCHOOL SCIENCE TEACHERS AND EDUCATORS

MILDRED EINZIG—10704 Shaker Boulevard, Cleveland, Ohio
CLARENCE H. BOECK—University High School, Minneapolis, Minnesota
LOIS DRURY—Edison Junior High School, Champaign, Illinois
HAROLD R. HUNGERFORD—Kankakee West Junior High School, Kankakee, Illinois
JENNIE LIVINGSTONE—Central High School, Tulsa, Oklahoma
GATES WILLARD—Manhasset, Long Island, New York
R. B. BARTHOLOMEW—Cubberley Senior High School, Palo Alto, California
JOSEPH M. KELLER—Melbourne High School, Melbourne, Florida
DOROTHY VAUGHN—Neodesha High School, Neodesha, Kansas
LORENZO K. LISONBEE—Science Supervisor, Phoenix School System, Phoenix, Arizona

GROUP II. COLLEGE, UNIVERSITY AND OTHER PROFESSIONAL GEOLOGISTS

JEROME M. POLLACK—Department of Geology, Oklahoma City University
HALL TAYLOR—Department of Geology, Columbia University
CHARLES W. COLLISON—Department of Geology, University of Illinois
KONRAD B. KRAUSKOPF—School of Mineral Sciences, Stanford University
JACOB FREEDMAN—Department of Geology, Franklin and Marshall College
JOHN CLARK—Department of Geological Engineering, South Dakota School of Mines
L. DON LEET—Division of Geological Sciences, Harvard University
W. TAYLOR THOM, JR.—Department of Geology, Princeton University
SISTER PASCHAL OSB—College of Saint Benedict, Saint Joseph, Missouri
DANIEL S. TURNER—Consulting Geologist, Denver, Colorado

GROUP III. STATE GEOLOGICAL SURVEY PERSONNEL

HELEN M. MARTIN—Michigan Geological Survey
GRACE MUILENBURG—Kansas Geological Survey
GEORGE M. WILSON—Illinois State Geological Survey
WALTER C. BROWN—Ohio Geological Survey
A. S. FURCRON—Georgia Department of Mines, Mining and Geology
GORDON B. OAKESHOTT—California Division of Mines
ALLEN F. AGNEW—South Dakota Geological Survey
ALAN R. GEYER—Pennsylvania Bureau of Topographic and Geologic Survey
VIRGIL E. BARNES—Bureau of Economic Geology, University of Texas
ERNEST DOBROVOLYNY—United States Geological Survey, Denver, Colorado

GROUP IV. REPRESENTATIVE OF OTHER EARTH SCIENCE

DEAN B. McLAUGHLIN—Department of Astronomy, University of Michigan

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reviewed and evaluated by the conferees and new materials will be developed. As indicated by the organizational chart and flow sheet, after a few days of orientation, the conference members will be assigned to small task force groups composed of teachers and geologists to attack specific problems.

In mid-August a Board of Visitors will be invited to Duluth to review the work of the Conference. The visiting group will include people prominent in the field of science education at national and state levels. There will also be academic leaders in the field of geology and geologist-executives from industry.

The materials developed by the Duluth Conference will be tested, revised and edited before they are released on a large scale to help in upgrading the instruction in geology concepts in school science programs.

LEFT. University of South Carolina students and faculty members gather around visiting scientist Ernst Cloos, kneeling in the foreground, to examine an outcrop.

RIGHT. Visiting Grover E. Murray (right) of LSU poses with Wheaton College's President V. Raymond Edman (center) and Geology Department Head, Donald C. Boardman.

AGI VISITING GEOSCIENTIST PROGRAM HAILED SUCCESSFUL

The AGI Visiting Geoscientist Program has made it possible to provide visits by nearly 50 nationally recognized geoscientists to about seventy college campuses throughout the country in a program to advance geological education. Reports on the visits, most of which were completed by the end of April, have been most enthusiastic. Both the host institutions and the visitors appeared to have derived a great deal of satisfaction from the experience.

The program was made possible through a grant to the AGI by the National Science Foundation, which provided travel expenses and a honorarium to the visitors for time spent on campus. The selection of the scientists forming the Visiting Geoscientist roster and the matching of the visitors to host departments requesting participation were carried out with the aid of ad hoc groups appointed by the AGI Education Committee. Participation was restricted with several exceptions to the smaller departments, with five or fewer faculty members.

Details for the visits were worked out by the visitors and the host institutions within the broad framework suggested by the Institute, so that each visit featured different things.

The Institute is hopeful that it will be possible to continue the program in the 1960 academic year.

AGI VISITING GEOSCIENTIST PROGRAM
1958-59 ACADEMIC YEAR

Visiting Scientists	Host Institutions
Dr. Philip H. Abelson	Lafayette College
Dr. Charles A. Anderson	Colby College
	Bates College
Dr. James R. Balsley	Wesleyan University
	Trinity College
Dr. Harold M. Bannerman	University of Connecticut
Dr. Charles Bates	Wellesley College
	University of New Hampshire
Professor Robert L. Bates	The Principia College
	Oklahoma City University
Professor Kenneth E. Caster	Hardin-Simmons University
	West Texas State College
Professor Arthur B. Cleaves	University of Mississippi
Professor Ernest Cloos	Univerity of South Carolina
Profesor Kenneth L. Cook	Colorado CIlege
Professor Carey Croneis	Cornell College
	Iowa State College (1 day)
Professor Ronald K. DeFord	Southwestern Louisiana Institute
Professor A. J. Eardley	San Diego State College
	Pomona College
Dr. Richard M. Foose	University of Alaska
Professor Robert M. Garrels	Colgate University
	Hamilton College
Dr. James Gilluly	Franklin & Marshall College
Professor Edwin N. Goddard	American University
Professor Darrell S. Hughes	Tulane University
	Mississippi Southern University
Dr. Charles B. Hunt	Occidental College
Professor Earl Ingerson	State University of Iowa
	Iowa State College (1 day)
Professor Richard H. Jahns	Montana State University
Dr. Stanley E. Jerome	Notre Dame University
Dr. Walter D. Keller	Emory University
	Georgia Institute of Technology
Professor Konrad B. Krauskopf	The State College of Washington
	University of Idaho
Professor W. C. Krumbein	University of South Dakota
Dr. Morris M. Leighton	Earlham College
	Muskingum College
Dr. A. I. Levorsen	Dartmouth College
Dr. Chester R. Longwell	New Mexico Institute of Mining & Tech.
	University of New Mexico
Dr. T. S. Lovering	Washington & Lee University

(Continued on page 26)

GEOLOGY in the Public Eye

by Robert L. Bates

"Behind the Scenery in Kentucky" is the title of a new booklet by Arthur C. McFarlan of the Kentucky Survey. Intended for the general reader, the publication contains 144 pages, and is paperbound, with pictures in color on both covers. After a 17-page introduction on basic geology, there are sections on limestone caves, sinking creeks, Cumberland Gap, Falls of the Ohio, Kentucky Lake, and a number of other features for which the Bluegrass State is famous. The subject matter is handled mostly by photographs and diagrams, both of which are well reproduced on good paper. The text is restricted to figure captions and an informal running commentary. Although the draftsman was not clear as to the distinction between *its* and *it's*, and there are several misprints, the booklet should acquaint both student and layman with the landscape of a state that Dr. McFarlan obviously knows from one end to the other. Special Publication 10 is available from the Survey at Lexington for $2.00.

The water resources section of the Michigan Survey has been publishing a quarterly leaflet, *"Water Views,"* in cooperation with the Michigan Well Drillers' Association. Circulation is about 1,000, of which 700 goes to the drillers and the remainder to engineering firms, libraries, individuals, and interested agencies. A feature that has aroused interest is the quarterly summary of precipitation, runoff, and ground-water conditions, entitled Water Came—Water Stayed—Water Went. Budget problems have forced temporary suspension of *"Water Views,"* but we hope it can be revived. (New drink at Lansing: Michigan-on-the-rocks.)

Where would you look for a fine structure section of faulted rocks above a salt intrusion, with several oil pools reached by 5 wells drilled from a single offshore platform? In an ad of the Pure Oil Company, of course, which appeared during March in the *Satevepost* and elsewhere. And a very nice job, too.

Which reminds us—it is planned to drill a well from a barge in the ocean, through some 5 miles of crustal material. (Don't ask us why.) The man who sits on this well will have to describe 3 feet of mud, 25,000 feet of basalt, and the Mohorovicic discontinuity. And not get seasick, either.

Southeastern Section GSA Officers are pictured above as they gathered for a chat at their recent meeting in Chapel Hill. From left to right are V. E. Nelson, Univ. of Ky.; Grover E. Murray, La. State Univ.; John M. Parker III, N. C. State College; L. D. Toulmin, Fla. State Univ. and Roy L. Ingram, Univ. of N. C. Professor Ingram is retiring chairman who is succeeded by Professor Murray. Professor Nelson succeeds Professor Parker as Vice-chairman and Professor Toulmin continues as Secretary.

AIME Endowment Fund X

With the passing of the noted consulting engineer, Henry C. Krumb, last December 27, the identity of the donor of AIME's Endowment Fund X became known. Upon his death an additional gift brought the fund to $860,272 and it will now be known as the Henry C. Krumb Endowment Fund.

As a director of Newmont Mining Corporation, O'okiep Copper Co., Ltd. and Newmont Oil Co., Mr. Krumb had broad interests in the petroleum and mining industries.

To the School of Mines, Columbia University, of which Mr. Krumb was a graduate, he left a bequest which may reach $10 million, in addition to endowing a chair of mining and adding to a scholarship fund.

FILMS OF INTEREST

• ELECTRICAL WELL LOGGING. 16 mm. Sound. Color. 21 minutes. This splendid film, prepared cooperatively by the University of Texas and the Schlumberger Corporation, explains some of the elementary theory of self-potential and resistivity well logging. Animated drawings describe current flow in the bore hole and formations, and on-the-spot filming shows the use of logging equipment in the field. Recommended for all who are beginning the study of electrical well logs. DISTRIBUTER: *Schlumberger Well Surveying Corp., Houston, Texas.*

• EYE TO THE UNKNOWN. 16 mm. Sound. Color. 32 minutes. Shown here are some of the ways in which the mass spectrometer, measuring the variable behavior of different elements in magnetic fields, can help solve complex problems in such different areas as medicine, metal fabrication and earth science. Geology is not stressed, but an inspiring story of scientific research is unfolded, and this provides useful background information for all geology majors. DISTRIBUTOR: *Modern Talking Picture Service, 21 W. 60th St., New York 23, N. Y.* (also in 27 other cities).

• GLASS AND YOU. 16 mm. Sound. Color. 25 minutes. 1955. *Reviewed by Paul R. Shaffer.* This well prepared film first describes volcanic glass, then considers man's early use and manufacture of glass, and finally discusses the techniques used in making various kinds of glass today. Engrossing, educational, and beautifully photographed. Particularly useful for classes in ceramics and economic geology. DISTRIBUTOR: *Association Films, Inc., 561 Hill Grove Ave., LaGrange, Illinois.*

• IT'S THE EXTRA JIGGLE THAT COUNTS. 16 mm. Sound. Color. 22 minutes. 1958. *Reviewed by Oswald C. Farquhar.* The theory of ore beneficiation by jigging is reviewed. Improved stratification and higher capacity can be achieved by using a newly developed dual-excentric process. The application of different settling velocities in mineral separation is explained, using animation, and then illustrated with iron ores collected in the field. DISTRIBUTOR: *Western Machinery Co., 650 Fifth St., San Francisco 7, California.*

Glossary Critics Welcomed

But be specific and constructive

Everybody likes to indulge in criticism at one time or another. As a matter of fact some people are perpetually intoxicated with it.

Here is a chance for geoscientists to be critical. You can be mildly critical or vehemently critical. The only request is that your criticism be specific and constructive.

Send your glossary suggestions to

Dr. J. Marvin Weller
Department of Geology
University of Chicago
Chicago 37, Illinois

A revision of AGI's Glossary of Geology and Related Sciences is underway under auspices of the Glossary Review Committee. A supplement to the first edition is planned which will include new scientific terms overlooked in the preparation of the first edition and corrections of some of the more critical errors found in the earlier volume.

All new terms submitted for consideration in the supplement should be defined in full and should carry the exact reference to the publication in which the term first appears. Discussion of terms thought to be incorrectly cited in the present Glossary should be specifically documented.

If you have failed to find accepted terms (other than Moho) between the covers of the Glossary—do something about it. If you feel that the Glossary's definitions of cactolith, graywacke or Purgatory are less than adequate, put your specific constructive criticism on paper.

The Glossary through additions and refinements will be just about as good as the profession wants to make it. Send your criticism and suggestions to *Dr. J. Marvin Weller, Chairman, Glossary Review Committee, Department of Geology, University of Chicago, Chicago 37, Illinois.*

ABUNDANCE OF MAJOR ELEMENTS IN THE EARTH'S CRUST[1,2] (by weight per cent)[3,4]

by Arie Poldervaart and Jack Green

No.	Rock Type	Si	Ti	Al	Fe^{+3}	Fe^{+2}	Mn	Mg	Ca	Na	K	P	C*	Other
	MAJOR UNITS													
1	Lithosphere (clarkes of elements)	25.8	1.0	8.1	2.0	4.5	0.2	3.1	6.0	2.2	1.6	0.1	0.1	
2	Continental igneous rock	29.1	0.4	8.1	Total 4.65		0.1	1.7	3.3	2.5	2.5	0.1	0.0	0.2
3	Continental surface crystalline rock	31.0	0.4	8.2	1.3	2.2	0.1	1.2	2.7	2.6	2.7	0.1		
4	Continental crust	27.9	0.7	8.2	1.5	4.0	0.1	2.5	4.6	2.3	2.0	0.1		
5	Orogenic belt crust	27.3	0.7	8.3	2.0	3.7	0.2	2.6	5.2	2.3	1.8	0.1		
6	Continental margin crust	23.6	1.1	7.8	2.1	5.1	0.1	3.6	7.7	1.9	1.0	0.1	0.6	
7	Pacific basalt (116)	22.0	1.8	8.0	2.6	6.3	0.1	4.8	7.8	2.0	0.8	0.1		
8	All sediments (unmet.)	23.6	0.4	5.9	2.4	1.3	0.2	1.6	10.9	1.0	1.3	0.0	3.1	
9	Cont. shield sediment	28.3	0.2	4.7	1.7	0.9	tr	1.7	7.6	0.6	1.7	0.0	2.7	
10	Orogenic belt sediment	24.3	0.3	6.0	1.8	1.6	tr	2.3	9.0	1.0	2.0	0.0	3.1	
11	Continental margin sediment	24.9	0.5	6.4	2.4	1.5	0.2	1.4	9.6	1.2	1.2	0.1	2.5	
12	Hemipelagic sediment	18.3	0.5	6.2	3.8		0.4	1.0	17.9	0.7	1.2	0.0	3.5	
13	Pelagic sediment	13.3	0.2	4.3	3.5		0.5	1.1	21.8	0.6	1.0	0.1	6.2	
14	Seawater - residence time in years shown in parentheses	Cl^{-1}=1.936, Na^{+1}=1.077 (2.6×10^8), SO_4^{-2}=0.2701, Mg^{+2}=0.1298 (4.5×10^7), Ca^{+2}=0.0408, (8.0×10^6), K^{+1}=0.0387, HCO_3^{-1}=0.0123 (1.1×10^7), Br^{-1}=0.0066, H_3BO_3=0.0027, Sr^{+2}=0.0014, F^{-1}=0.0001 (1.6×10^7)													
	METEORITES (silicate phase)													
15	Stony meteorite (107)	21.5	0.1	1.8		13.2	0.3	16.5	2.1	0.8	0.2	0.2		Cr=0.4
16	Chondrite (96)	21.9	0.1	1.7		12.3	0.2	17.8	1.7	0.8	0.1	0.1		Cr=0.3
17	High total iron chondrite (40)	22.2	0.1	1.7		10.5	0.2	18.5	1.9	0.9	0.2	0.1		Cr=0.3
18	Low total iron chondrite (56)	21.6	0.1	1.6		13.5	0.2	17.3	1.6	0.9	0.2	0.1		Cr=0.3
19	Enstatite chondrite (6)	27.8	0.1	1.6		1.0	0.2	19.4	1.1	1.1	0.2	0.1		Cr=0.2
20	Carbonaceous chondrite (15)	17.5	0.1	1.6		19.6	0.2	15.6	1.9	0.8	0.1	0.2	3.2	Cr=0.4
21	Chondritic-type achondrite (12)	25.1	0.1	0.6		7.8	0.3	19.7	0.8	0.3	0.0	0.0		Cr=0.5
22	Basaltic-type achondrite(22)	21.9	0.3	6.4		12.6	0.4	5.9	7.8	0.3	0.1	0.0		Cr=0.3
	IGNEOUS ROCKS													
23	Ultramafic rocks (182)	20.7	1.0	3.3	3.2	6.8	0.1	13.8	7.3	0.6	~.004	0.1		
24	Dunite (9)	18.9	0.1	0.5	1.3	9.3	0.2	26.2	0.5	0.2	~.001	0.0		
25	Peridotite (23)	20.5	0.5	2.1	1.8	7.7	0.2	20.7	2.5	0.4	~.004	0.0		
26	Mafic rocks incl. nepheline types(721)	22.7	1.2	8.3	2.1	6.1	0.1	5.0	7.6	1.9	0.8	0.1		
27	Mafic rocks excl. nepheline types(637)	22.8	1.1	8.3	2.0	6.3	0.1	5.2	7.7	1.7	0.6	0.1		
28	Gabbro (160)	22.8	0.8	9.0	1.8	6.2	0.1	4.9	8.0	1.7	0.5	0.1		
29	Alkali basalt (96)	21.6	1.6	7.8	2.2	6.8	0.2	5.7	7.7	2.0	0.8	0.2		
30	Tholeiite (102)	23.8	0.8	8.3	0.8	7.6	0.2	4.2	7.5	1.6	0.8	0.1		
31	Intermediate rocks incl. nepheline types(810)	25.7	0.9	9.2	2.3	3.6	0.1	2.0	4.2	3.8	3.0	0.2		
32	Intermediate rocks excl. nepheline types(635)	25.7	0.9	8.7	2.3	4.1	0.1	2.3	4.7	3.1	2.7	0.2		
33	Diorite (50)	24.4	0.9	8.8	1.9	5.5	0.1	3.7	6.1	2.5	1.1	0.2		
34	Latite (42)	25.5	0.7	9.2	2.7	3.1	0.1	2.4	4.9	2.5	3.7	0.2		
35	Andesite (49)	25.6	0.8	9.2	2.5	4.3	0.1	2.7	5.7	2.7	0.9	0.1		

[1] Detailed references for this data sheet may be found on page 27, GeoTimes, May-June 1959

[2] Numbers in parentheses following rock name refer to number of analyses. Example: Basalt (116) = 116 analyses of basalt

[3] Per cent of oxygen = 100% - sum of other constituents

[4] Blanks indicate an assumed value of 0.0, not supported by analyses

* Inorganic carbon

CORRECTIONS TO AGI DATA SHEET 9

The AGI Data Sheet Committee has proposed the following changes in AGI Data Sheet 9 as it appeared in the November-December 1958 issue of GeoTimes:

Dimensions and Mass Properties of the Earth: Area of lands ... 148 X 10^6 km^2; Area of oceans .. 362 X 10^6 km^2, Average height of lands .. 823 m, Average depth of oceans ... 3.82 0.2 km. Dimensions and Properties of Internal Layers of the Earth: Under column headed "Depth to boundaries (km)" - Mantle ... 33-2898 - Core ... 2898-6371, under column headed "Fraction of volume" - Core ... 0.1620. The Hydrosphere: First column heading should read "Volume ((in 10^6 km^3)". Under column headed "Mass (in 10^{21} g)" - Oceans ... 1380*. Add footnote */ Mass including salts 1430 X 10^{21} g.

Additional copies of the revised AGI Data Sheet 9 may be obtained from the American Geological Institute, 2101 Constitution Avenue, N. W., Washington 25, D. C., at a cost of $0.10 per copy, or in a set of data sheets 1-10 for $0.75 per set.

AGI DATA SHEET 12

This data sheet is prepared under the auspices of the AGI Data Sheet Committee by Dr. Jack Green of Aero-Space Laboratories, North American Aviation Missile Division, Downey, California, and Dr. Arie Poldervaart, Professor of Geology, Columbia University, New York, N. Y.

Suggestions for future data sheets should be addressed to Dr. Richard M. Foose, Chairman AGI Data Sheet Committee, Stanford Research Institute, Menlo Park, Calif.

No.	Rock Type	Si	Ti	Al	Fe^{+3}	Fe^{+2}	Mn	Mg	Ca	Na	K	P	C*	Other
36	Anorthosite (in massifs) (9)	25.7	0.3	13.7	0.6	1.1	0.0	0.5	6.9	3.5	0.9	0.1		
37	Monzonite (46)	26.0	0.7	8.8	1.8	3.6	0.1	2.2	4.9	2.6	3.9	0.2		
38	Calc-alkalic trachyte(24)	27.4	0.4	9.6	1.8	1.6	0.1	1.3	3.1	2.9	6.2	0.1		
39	Dacite (50)	29.9	0.4	8.9	1.6	2.4	0.1	1.3	4.0	3.0	1.2	0.1		
40	Tonalite (58)	31.1	0.4	8.3	1.0	2.7	0.1	1.2	3.3	2.9	1.2	0.1		
41	Felsic igneous rock (794)	32.4	0.3	7.7	1.2	1.7	0.1	0.7	1.9	2.9	3.2	0.1		
42	Granodiorite (137)	31.5	0.3	8.3	0.9	2.0	0.1	1.0	2.6	2.9	2.6	0.1		
43	Adamellite (121)	32.5	0.3	7.8	0.9	1.8	0.1	0.6	1.8	2.5	3.8	0.1		
44	Calc-alkalic granite(72)	33.9	0.2	7.4	0.6	1.3	0.1	0.3	1.0	2.3	4.6	0.1		
45	Calc-alkalic rhyolite(22)	34.7	0.1	7.2	0.9	0.6	0.0	0.2	0.8	2.2	4.5	0.0		
	SEDIMENTARY ROCKS													
46	Paleozoic sandstone (130)	33.9	0.4	4.5	3.1			1.3	3.0	0.4	1.8		1.1	S=0.3
47	Mesozoic sandstone (23)	33.4	0.3	4.3	4.2			0.8	3.8	0.6	1.7		1.1	S=0.1
48	Cenozoic sandstone (5)	35.3	0.3	4.1	2.7			1.0	3.3	0.5	1.8		0.9	S=0.1
49	Arkose (3)	35.6		6.1	1.7		0.2	0.1	1.1	1.5	4.7		0.1	
50	Subgraywacke (3)	36.9	0.4	5.1	0.6	2.1	0.2	1.0	0.9	1.6	1.3	0.1	0.1	
51	Graywacke (11)	30.8	0.3	7.6	0.7	3.4	0.1	1.8	2.6	2.6	1.7	0.0	0.4	
52	Paleozoic shale (203)	24.4	0.5	8.5	4.9			2.3	5.6	0.6	3.2		1.9	S=0.3
53	Mesozoic shale (32)	27.2	0.5	9.0	4.5			1.4	4.4	1.0	2.4		1.3	S=0.1
54	Cenozoic shale (17)	28.5	0.4	6.8	4.5			1.5	5.0	0.8	2.2		1.5	S=0.1
55	Paleozoic carbonate (>178)	3.0		1.1	1.3			5.2	28.0					S=1.5
56	Mesozoic carbonate (>9)	8.3		1.4	1.2			0.6	31.0				10.1	S=0.1
57	Cenozoic carbonate (>3)	5.8		1.1	0.8			0.7	25.1					S=0.1
58	Terrigenous mud	25.9	0.7	8.9	5.3		0.6	1.5	8.8	1.0	1.7	0.1		
59	Pelagics excl.calcareous & diatomaceous types (21)	24.4	0.7	9.6	5.4		1.0	1.9	2.8	3.6	2.6		2.0	
60	Calcareous ooze (pelagic)	8.8	0.2	2.7	2.7		0.3	0.8	27.9	0.4	0.6	0.1	8.1	
61	Siliceous ooze (pelagic)	25.9	0.3	8.0	4.1		0.5	1.4	6.9	0.7	1.8	0.1	1.9	
62	Red clay (pelagic)	24.7	0.5	8.7	6.3		0.8	1.8	5.5	1.3	2.2	0.1	1.3	
	METAMORPHIC ROCKS													
63	Serpentine (5)	20.6	0.0	0.5	0.3	0.9	0.0	24.5	0.0	(5-30ppm)				H=1.4-12.7H_2O
64	Eclogite (34)	22.9		7.7	2.7	7.1		5.4	8.2	1.9	0.6			
65	Amphibolite (200)	23.5	1.0	8.3	2.5	6.1	0.2	4.2	6.8	2.2	0.9	0.1		
66	Slate (61)	28.9	0.4	10.1	2.3	4.2	0.2	1.8	0.7	1.3	3.2	0.0		
67	Phyllite (50)	28.1	0.7	11.0	2.1	3.7	0.1	1.8	0.9	1.5	3.3	0.1		
68	Mica schist (103)	30.1	0.6	9.3	1.5	3.6	0.1	1.6	1.4	1.4	3.1	0.1		
69	Quartzofeldspathic gneiss (250)	33.1	0.3	7.7	1.1	1.6	0.1	0.7	1.6	2.4	3.2	0.1		
70	Metaquartzite (18)	37.5		5.1	1.6	1.0		0.6	0.8	1.4	2.2			

* Inorganic carbon

EXPLANATION

Per cent oxygen = 100% - the weight per cent of the cations. If no data are recorded for a particular element, this indicates that the element was either less than 0.1 per cent for most of the individual analyses or no analysis for that element was reported. Averages 1, 3-6[K,P]-11[K]-14 (Poldervaart, 1955, Geol. Soc. America, Special Paper 62, p. 119-144); average 2 (Vinogradov, 1956, Geokhimiya, p. 44); averages 15-23[V], 24[P], 25[V]-35 (Green and Poldervaart, 1958, Geochim. Cosmochim. Acta, v. 13, p. 93-94). Averages 36-45, 49-51, 58, 61, 62, 64-70 (Green and Poldervaart, 1958, Ibid., p. 94 and 103; 46-48, 52-57[*], 59[+] (Green, 1959, Geochemical table of the elements for 1959: Geol. Soc. America, in press); 60 (Poldervaart, 1955, Ibid., p. 125); 63 (Nagy and Faust, 1956, Am. Mineral., v. 41, p. 826).

* recalculated, based on continental margin profiles in Drake, Ewing, and Sutton, 1959, Continental margins and geosynclines: Physics and Chemistry of the Earth, v. 3, in press.

[V] modified, using data of Ahrens, Pinson, and Kearns, 1952, Geochim. Cosmochim. Acta, v. 2, p. 229-242.

[P] recalculated from Vinogradov and Ronov, 1956, Geokhimiya, p. 4-6, 8 and 11.

[+] modified from Goldberg and Arrhenius, 1958, Geochim. Cosmochim. Acta, v. 13, p. 209; these authors also furnishing residence times for elements of average 14.

VISITING GEOSCIENTISTS—Continued from page 26

Professor Gordon A. Macdonald — W. Washington College of Education, College of Puget Sound
Dr. Edwin D. McKee — Univ. of Dayton; Kent State Univ.
Professor Grover E. Murray — Wheaton College, Bowling Green State University
Professor Charles F. Park, Jr. — Montana State College
Professor F. J. Pettijohn — Syracuse University
Professor Arie Poldervaart — Smith College, Mount Holyoke College, Amherst College, University of Massachusetts
Dr. John D. Ridge — Harpur College
Dr. R. Dana Russell — Fresno State College, San Jose State College
Professor Robert P. Sharp — Carleton College, Macalester College
Professor Robert R. Shrock — Middlebury College
Professor Laurence L. Sloss — University of Florida, University of Tennessee
Professor John Verhoogen — University of Oregon
Dr. Stewart R. Wallace — South Dakota School of Mines
Professor Lawrence A. Warner — Ohio Wesleyan University, Denison University
Professor Aaron C. Waters — University of Rochester
Dr. Lewis G. Weeks — Oberlin College, College of Wooster

DETAILED REFERENCES FOR DATA SHEET 12

Abundance of Major Elements in the Earth's Crust

by Arie Poldervaart and Jack Green

Average 1 recalculated from Poldervaart, A., 1955, Chemistry of the earth's crust: Geol. Soc. America, Special Paper 62, p. 133, using revised values for average 11 *q.v.*; average 2 Vinogradov, A. P., 1956, The regularity of distribution of chemical elements in the earth's crust: Geokhimiya, p. 44 (in Russian)—in English translation by Atomic Energy Research Establishment, Harwell, Berkshire, England, 1957, A.E.R. E. Lib/Trans 795 (63 pages, unclassified); average 3 (Poldervaart, 1955, p. 127); averages 4 and 5 (*ibid.*, pp. 129 and 130); averages 6 and 8 (*ibid.*, pp. 132 and 133, recalculated, using revised values for average 11 *q.v.*); average 7 (Green, J., and Poldervaart, A., 1958, Petrochemical fields and trends: Geochim. Cosmochim. Acta, v. 13, p. 89, their average 50); averages 9 and 10 (Poldervaart, 1955, pp. 125 and 129); average 11 (*ibid.*, p. 131, revised on basis of continental margin profiles by Drake, Ewing, and Sutton, 1959, Continental margins and geosynclines: Physics and Chemistry of the Earth. v. 3—original plate numbers 30 and 34). Much uncertainty and considered opinion is involved in the weighting of analyses to obtain this average: 40% miogeosynclinal sediments composed of 50% hemipelagic sediment (Poldervaart, 1955, p. 131), and 50% young folded belt sediment (*ibid.*, p. 130); and 60% eugeosynclinal sediments composed of 35% subgraywacke (*ibid.*, p. 135), 35% terrigenous mud (*ibid.*, p. 131), 20% calcareous mud (*ibid.*, p. 125), 5% andesite (*ibid.*, p. 134) and 5% tholeiite (*ibid.*, p. 134); average 12 (*ibid.*, p. 131, recalculated, using revised values for average 11 *q.v.*); average 13 (*ibid.*, p. 125); average 14 (*ibid.*, p. 121); averages 15-22 (Green and Poldervaart, 1958, p. 114); averages 23-25 (*ibid.*, p. 93, their averages 32, 12, and 29 recalculated, using data from Ahrens, L. H., Pinson, W. H., and Kearns, M. M., 1952, Association of rubidium and potassium and their abundance in some common igneous rocks and meteors: Geochim. Cosmochim. Acta, v. 2, pp. 229-242); averages 26-45 (Green and Poldervaart, 1958, pp. 93-94, their averages 68, 70, 69, 44, 87, 115, 116, 97, 108, 111, 114, 123, 139, 157, 164, 171, 167, 173, 190, and 196 respectively); averages 46-48, 52-57 (recalculated from Vinogradov, A. P., and Ronov, A. B., 1956, Composition of sedimentary rocks of the Russian platform in relation to the history of its tectonic movements: Geokhimiya, pp. 3-24 (in Russian) in compilation in Table 1 of Green, J., 1959, The Geochemical table of the elements for 1959: Geol. Soc. America (in press); averages 49-51, 58, 61, and 62 (Green and Poldervaart, 1958, p. 102, their averages 37, 38, 32; p. 101, their averages 14, 18 and 15 respectively); average 59 (*ibid.*, p. 106, modified from Goldberg, E. D., and Arrhenius, G. O. S., 1958, Chemistry of Pacific pelagic sediment: Geochim. Cosmochim. Acta, v. 13, pp. 153-211; data on page 209). For organic carbon in sediments see Ronov, A. B., 1958, Organic carbon in sedimentary rocks: Geokhimiya, pp. 409-423: shales (Paleozoic 0.62% organic carbon, Mesozoic 0.87%, Cenozoic 0.94%); sandstones (Paleozoic 0.20%, Mesozoic 0.48%, Cenozoic 0.27%; carbonates (Paleozoic 0.23%, Mesozoic 0.22%, Cenozoic 0.39%); average 63 (Nagy, B., and Faust, G. T., 1956, Serpentines, natural mixtures of chrysotile and antigorite: Am. Mineral., v. 41, pp. 817-838); averages 64-70 (Green and Poldervaart, 1958, p. 109, their averages 1, 3, 7, 4, 11, 24 and 26 respectively).

Geologists Visit Drake Well

On the 100th Anniversary of the Drilling of the Drake Well, the Field Conference of Pennsylvania Geologists, in their 24th annual meeting, May 15-17, will visit the classic northwestern Pennsylvania oil field areas. The field trip will include visits to the Drake Well and Museum, Pithole and other historic spots of the early days of oil. On the geologic side of the picture the geologists will study bedrock and glacial geology of Northwestern Pennsylvania and will visit the Penn-Dixie underground limestone mine to study structure and stratigraphy.

The conference registrants will be quartered at the Colonel Drake Hotel in Titusville, Pennsylvania. Additional information concerning the field trip and the guidebook can be obtained by writing *Field Conference Chairman, Topographic and Geologic Survey, Dept. of Internal Affairs, Harrisburg, Pa.*

F & M Offers Summer Geology Program

Contrary to the usual practice of closing up the home educational shop and offering only field-camp mapping courses in far away places in the summer, the Franklin and Marshall College Geology Department will experiment this summer with offering both semesters of its regular elementary geology course on its home campus in Lancaster, Pa. Physical Geology will be taught 6 days a week from June 15th to July 18th and Historical Geology July 22nd through August 25th. Four hours credit will be given for each half. The course is open to students from any college.

DEAR DR. STEPHENSON:

The Alpha Chapter of Sigma Gamma Epsilon would like to contribute the enclosed check for $25.00 to the American Geological Institute to support its many services and GeoTimes. Earth scientists, both professionals and students, are aware of the excellent job being done by the Institute. Many students benefit from its program, yet few are able to contribute regularly to its support.

We hope that the action in making this small donation will be followed by our fellow chapters and possibly geology clubs around the country. The size of the contribution is not as important as the idea that students are actively supporting an important aspect of the profession of which they hope to become members.

Sincerely yours,

ALPHA CHAPTER
Sigma Gamma Epsilon
University of Kansas

DEAR EDITOR:

How can Geology, either as a science or as a profession, hope to achieve any sort of communication with the general public as long as our relations with the press are as poor as they are at present? The attached clipping (EDITOR: Article headed *"200 Geologists coming here today to tour ancient crab, lobster beds"*) from a Waco, Texas, newspaper of March 13 is a journalistic attempt to relay to the public an announcement of a field trip to study Cretaceous (*not* Crustacean) reefs in Central Texas.

If we are not able to present our facts to geologically uninformed reporters, are we not to blame for the popular misconceptions about geology?

Yours truly,

J. S. PITTMAN, JR.

DEAR EDITOR:

A listing of names and addresses of the geological survey of the world together with the names of their current directors might be useful to your readers. If undertaken, corrected listings should be published from time to time.

Very truly yours,

BEN B. COX

DEAR EDITOR:

I was interested to read in the Jan.-Feb. issue of GeoTimes of the course in Invertebrate Paleontology offered at American University last fall. The idea of sharing the scientist is a good one, but not a new one. The University of Minnesota, Duluth Branch and other schools in the United States and Canada have from time to time offered courses in which survey, company and consulting geologists have been called upon to serve as instructors. In 1955 UMD offered a course in Advanced Economic Geology in which seven consulting and mining company geologists participated as instructors. The course was coordinated by Dr. Henry Lepp and taught by Thorold F. Field, consulting geologist, Cedric L. Iverson and Ralph W. Marsden, Oliver Iron Mining Division of the United States Steel Corporation, Hugh M. Roberts and Lloyd M. Schofield, consulting geologists, and George H. Spencer and J. F. Wolff, Oliver Iron Mining Division of the United States Steel Corporation.

Sincerely yours,

ROBERT L. HELLER
Associate Professor
Univ. of Minn., Duluth Branch

TO THE EDITOR:

It appears to me that the geologists of today are organized into the unique position of being a highly intelligent giant with tremendous muscular potential but without the knowledge of good footwork or a Sunday punch. Our mature giant has stood by a major depression in the petroleum industry and has yet to flex a muscle. This magnificent display of incoherent coordination leads me to offer the following suggestions and questions.

It is high time that this giant relinquish its passive attitude on major problems, express an opinion, roll up its sleeves and do something positive. I can think of no better time than *NOW* to clarify its standpoint on the effect that foreign oil imports have on domestic crude prices. What is being done to curb inflation (everyone's battle) and the rising cost of domestic operational expenses? What is being done to promote more domestic exploration and to create a healthy domestic industry? I believe that

this, "our giant", should show more reactionary concern and less pathos in the ratio of student geologists to the available jobs. There should be a concentrated research and "hard sell" program for the finding and placement of geologists into *NEW* industries. Finally, there should be as much or more time and money spent selling the value of the geologist and geology to management as there is spent in the program of educating high school students and boy scouts.

I for one say lets make this, "our giant", into an adult cognizant profession with a capital "P". We should stand alone if necessary and receive more of the commensurate rewards that are justly due. It appears quite obvious that the natural resources and the necessary operating tools are readily available for the change.

Very truly yours,

GRAHAM R. CURTIS

ROCK CHIPS

by SANDSTONE SAM

Copying from one book is plagiarism; copying from two books is research.

• • •

Synthesis: A compounding of detailed bewilderment into a vast and comfortable confusion which will offend no one.

• • •

A recent study shows that the majority of geologic maps in the U.S.A. are constructed on tracing paper while those in the U.S.S.R. are constructed on LINEN.

• • •

A student has written, "The crinoids were most abundantly sinking their stems and adding plates to stay on top of the sediments some of the stems have many plates and are quite long. The absence of the crinoids head are due to the abundance of scavangers which apparently ate the meat heads, leaving the crinoid stems in the lime sediments."

• • •

When the gleam in your eye is only the sun hitting your bifiocals—you are getting old!

EXPLORATIONS—EAST OF THE ANDES *by Victor Oppenheim, 267 pp., 1958, Pagent Press, Inc., 101 Fifth Ave., N.Y. 3, N.Y. $5.00*

Every geologist who reads this book will share with the author the priceless treasures of reminiscence of field experiences which provide a rich professional heritage. In recounting his experiences in exploration for petroleum and mineral resources in the still primitive country along the east slopes of the Andes, the author draws on the interwoven observations on geology, geography, ethnology and history, generously flavored with the thrills and high adventure of field work in virgin country. The layman will be captivated by the story of the expeditions of this geologist and his broad range of interests in the areas which he visited.

GEOLOGY OF THE GREAT LAKES, *by Jack L. Hough, 310 pp. 1958, University of Illinois Press, Urbana, Ill. $8.50*

This book presents in a non-technical style, understandable to the layman, the fascinating story of the geologic history of the Great Lakes. This book is organized in two major divisions: Part I, The Great Lakes Region: The Present Lakes and Pre-Lake History, and Part II, History of Lake Stages. Geologists will welcome the thorough review of Great Lakes geology stripped of professional jargon.

PRINCIPLES OF GEOCHEMISTRY, *Second Edition, by Brian Mason, 310 pp., 1958, John Wiley & Sons, 440 Fourth Ave., New York, N. Y. $8.50*

Since the first issue of this book was published in 1952 there has been a rapid development of geochemical research. The author has incorporated resulting new data and concepts within the framework of his treatment of the broad and complex subject of geochemistry. Written from the point of view of a geologist the book provides important orientation for chemists and physicists embarking on geochemical research.

HOW TO WRITE SCIENTIFIC AND TECHNICAL PAPERS, *by Sam F. Trelease, 1958, Williams & Wilkins Co., Baltimore 2, Md. $3.25*

This book can be of great assistance to

any scientific or technical man engaged in preparation of reports and papers. The book offers guides to the use of library facilities, the organization of data, and many specific aids on preparation of illustrations, graphs, abbreviations, citations, etc.

PRINCIPLES OF GEODYNAMICS *by Adrian E. Scheidegger, 280 pp., 86 figs., Springer-Verlag, Berlin W 35, Price: DM 49.60.*

The author, research associate with Imperial Oil Co., Ltd., of Calgary, attacks the difficult problem of summarizing and evaluating the current state of knowledge and thinking with regard to the earth's crust. He discusses physiographic, geologica, and geophysica data known about the earth, then discusses the various problems, theories, and concepts.

PHYSICS AND CHEMISTRY OF THE EARTH, *Volume II, Edited by L. H. Ahrens, F. Press, K. Rankama, and S. K. Runcorn, 259 pp., 1957, Pergamon Press, $10.00.*

Research in the borderline fields of geochemistry and geophysics is advancing so rapidly that scientists in these related fields are in need of up-to-date summaries of progress. This volume contains seven contributions that admirably meet this need. These are: An Experimental Approach to Problems in Physical Oceanography, by William S. von Arx; A Survey of the Quality of Some of the Principal Abundance Data of Geochemistry, by L. H. Ahrens; Boundary Conditions for Theories of the Origin of the Solar System, by Harold C. Urey; Some Current Aspects of Chemical Oceanography, by Francis A. Richards; Recent Geophysical Exploration of the Ocean Floor, by M. N. Hill; The Geochemistry of Gallium, Indium, Thallium—A Review, by Denis M. Shaw; Latitude Variation, by P. J. Melchoir.

The breadth of coverage makes it possible for the reader to find something in which he is interested, and his curiosity will be stirred by the less cognate topics so that he will read them, or at least skim through them to find out what they are all about. The high standards of this book should gain for it many friends and insure an interest in forthcoming volumes.

F.

THE PRESENTATION OF TECHNICAL INFORMATION, *by Reginald O. Kapp, 1958, 147 pp., The Macmillan Company, New York, $2.95.*

This small book, based on four public lectures given at University College, London, does exactly what its author tells other writers to do. It presents information simply and logically and in a manner that holds the reader's attention. Most of the material can be applied equally well to speaking and to writing.

The purpose of functional English is always to convey new information. The author stresses the need for improvement in standards of presentation of technical information. He compares functional and imaginative English and notes the particular problems presented by functional English. Other topics include: the work done by the person addressed; the importance of pace and timing in presenting information; explanation of your information, making it easy to understand and to remember; avoiding circumlocutions; use of generalizations; on meaning what you say; the use of qualifications and metaphors; the importance of words.

A.C.S.

HOW TO COLLECT MOUNTAINS, *by Charles B. Hunt, 38 pp., 1958, W. H. Freeman & Co., 660 Market St., San Francisco. $1.25.*

From the opening paragraph of the Foreword, which states that this is a manual to guide mountain collectors, to the Glossary, which defines *jargonite* as a "common mineral, particularly in Earth Science Manuscripts," this little booklet is charged with the humor that the early readers of the *Geological Newsletter* came to know. This booklet is not recommended reading for the many geo-type scientists who take themselves too seriously.

PETROLEUM: PREHISTORIC TO PETROCHEMICALS, *by G. A. Purdy, 500 pp., 1958, McGraw-Hill Book Co.,*

Herein is traced the development of the petroleum and petrochemical industries from geological and archaeological beginnings to present-day products through refining and petrochemical processes.

Although the main purpose of the book is educational and intended to serve as a textbook for training employees of Imperial Oil Limited, it is so written that the specialist who is seeking a comprehensive technical review of the industry or wishes to relate his field to the overall industry picture will be equally satisfied.

Mr. Purdy has compounded a book on many fields which in this day of specialization is a wonderful and timely contribution to aid us in keeping abreast of developments in other areas of the petroleum industry besides our own.

H.S.M.

FIELD TRIP CALENDAR *(Continued from page 3)*

Sept. 12-13—FRIENDS OF THE PLEISTOCENE, Rocky Mtn. Sect., field trip to Wind River Mts., Pinedale, Wyo. Write: Richmond, Denver Federal Center.

Sept. 13—ILLINOIS STATE GEOL. SURV., field trip to Silurian of Whiteside and Carroll Co's., Ill.

Early Oct.—UTAH GEOL. SOC., field trip of strat, struct. & economics of S Qqirrh Range, Utah; write Rigby or Bissell at Brigham Young Univ., Provo, Utah. Guidebook.

Oct. 4—ILLINOIS STATE GEOL. SURV., field trip of Coal Measures of Clark and Edgar Co's.

Oct. 7-10—ROCKY MOUNTAIN ASSOC. GEOL., field trip of Cretaceous of western Colo., a Cretaceous symposium of Colo. Write: Kretz, 722 Patterson Bldg., Denver. Guidebook.

Mid-Oct.—TRI-STATE GEOL. FIELD CONF., field trip of Cambrian & Ordovician of Driftless area, SW Wisc.; write: Cline, Univ. Wisc., Madison, Wisc.

Oct. 15-17—NEW MEXICO GEOL. SOC., general geology of West Central New Mexico; write NMGS, Box 27, Socorro, N.M. Guidebook.

Oct. 17-18—NEW ENGLAND INTERCOLL. GEOL. CONF., field trip to cover Taconic sequence in W. Vt., Vt. marble belt, and Foreland sequence E of Lake Champlain; write: John B. Lucke, Univ. Conn., Dept. Geol., Storrs, Conn. Guidebook.

Oct. 18—ILLINOIS STATE GEOL. SURV., field trip of Coal Measures of Washington Co., Ill.

Nov. 5-8—WEST TEXAS GEOLOGICAL SOCIETY, field trip to Val Verde Basin of Terrell, Pecos, and Val Verde Counties, Texas. Write: E. L. Dillon, Box 1509, Midland, Texas. Guidebook?

MORE ABOUT OUR COVER

Our cover for this issue, a photograph by Professor G. C. Amstutz of the Missouri School of Mines, is a view of La Oroya location of the Cerro de Pasco field headquarters and smelter. The town is built on alluvial terraces of the Mantavo River, a tributary of the Amazon.

The river at this point follows essentially an anticlinal valley in Mesozoic and early Tertiary beds of limestone, shale and sandstone, with some volcanic tuffs and lavas to the west (left). Secondary folding, with some overturning of beds, can be seen on slopes in the background. Vegetation is sparse due to smelter fumes so that the exposed red, yellow, tan and white beds accentuate strikingly the geologic structure.

1959 STUDENT SURVEY

(Continued from page 17)

graduates reported by college registrars. There is usually a lag of more than one year in the publication of the U. S. Office of Education figures and they do not list all schools offering degrees in geology-geophysics.

The student survey also was accompanied by a query into employment conditions for recent graduates. Most departments reported few job possibilities for their graduating seniors, while the employment outlook for students completing graduate work was reported to be on the upturn. The survey showed the observations on employment prospects to vary considerably from campus to campus.

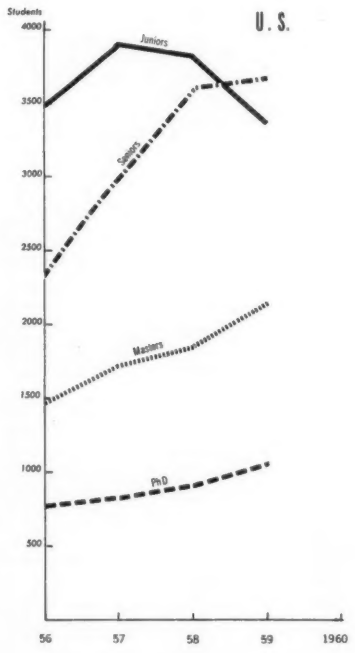

FIGURE 2. Graph showing trends in enrollment of geology-geophysics students at various academic levels in colleges and universities of the United States in the years 1956 to 1959.

MANPOWER *in a column —*

By HOWARD A. MEYERHOFF
Scientific Manpower Commission
1507 M Street, N.W., Washington 5, D. C.

Early in April the Society of American Military Engineers sponsored a Military-Industrial Conference on "Soviet Economic Strategy." Officially, your columnist represented the Scientific Manpower Commission; but, finding himself the only geologist on the program, he unofficially represented the geological profession.

Had not geology been smuggled in by the back door in this fashion, the significance of the earth sciences in Soviet progress would have been ignored save for incidental mention. Scarcely a member of the audience of 1,000 seemed even dimly aware of the fact that the USSR has, by deliberate choice, been following the pattern of American growth and development. Stalin regarded the exploration and exploitation of mineral raw materials as the basic factor in American economic strength. He scoured Russia for prospectors, geologists, and geophysicists, whose discoveries of Soviet mineral resources are the foundation of Communist potential.

Americans seem to have forgotten this significant facet of their history, for domestic exploration is at low ebb. There is more interest in the development and purchase of mineral products from abroad than in initiating a renaissance of domestic exploration, using the new technologies. In the absence of a national policy earth scientists, like the mineral industries in which they are employed, are the victims of every vicissitude in the business cycle.

Not a single agency of the Federal government has any idea how many American technologists are working in foreign countries. They know, to be sure, that more than 2,000 are engaged in the International Cooperation Administration's world-wide activities. One third of them are in programs dealing with industry, mining, and transportation. But few realize that the earth scientists working outside the boundaries of the United States outnumber the specialists in any other single field. Deep concern has been expressed about the export of Russian scientific and engineering manpower, yet the Department of State estimates that there were only 1,600 Communist technicians in underdeveloped countries last year. Our government seems unaware of the service that privately employed American technologists can perform abroad by enlisting earth scientists to take with them not only their technology but also their best American manner. In the war for men's minds manpower is vital. In the earth sciences we have it. Let us advertise the fact and, in so doing, advertise the profession and its importance.

Geology for High School Students

The School of Engineering of Columbia University is conducting a summer program of instruction to benefit talented high school students. More than seventy students are expected to be enrolled in this program which will be conducted with support from the National Science Foundation to introduce gifted high school students to college-level mathematics, geology and thermodynamics.

The math students will attend classes on the Columbia campus but the 20 boys selected for geology and 20 boys for thermodynamics will live and study at the University's summer camp at Litchfield, Connecticut. The boys chosen will have completed their junior year in high school or will be entering the junior year this fall.

The Department of Geology will be cooperating with the School of Engineering in providing geological instruction at the summer camp.

Monograph Prizes in Science

The American Academy of Arts and Sciences is offering annually a prize of $1000 to the author of the unpublished monograph considered most meritorious in the field of physical and biological sciences. Similar awards are to be made in humanities and the social sciences.

A monograph is defined for the purposes of the awards as a "scholarly contribution to knowledge too long for an article in a learned journal and too specialized or too short for a general book."

Closing date for entries for 1959 is October 1. The awards will be announced in December. More details may be received by writing the Committee on Monograph Prizes, Academy of Arts and Sciences, 280 Newton St., Brookline Station, Boston 46, Mass.

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occurs also in tropical and temperate regions and at low altitudes (Rueger, 1905, p. 1206; Crookes, 1905, p. 73).

The length of time required for glass to become purple depends partly on the composition of the glass, especially its manganese content, partly on the exposure to sunlight, and partly on the color of the background. Given optimum conditions the color change can occur in less than a month (Gortner, 1908, p. 162). Exposure of less than a year produced violet color in most old glass containing appreciable quantities of manganese, and in some bottles the coloring occurred before the gummed paper labels were destroyed (Alway and Gortner, 1907, p. 5). The color becomes more pronounced as the time of exposure is lengthened. Background colors seem to affect the rate of color change too. Violet colored backgrounds accelerate the color change, presumably by favoring the ultra-violet rays; black and brown backgrounds seem to retard the change. Backgrounds of white, yellow, blue, and red seem to have no influence. Backgrounds containing manganese have no effect (Gortner, 1908, p. 162).

Few modern bottles made of clear glass become purple. This is because their manganese content generally is low, not because the time of exposure has been insufficient. Modern clear glass like liquor bottles or grocery bottles is likely to contain less than 0.001 per cent manganese and only 0.02 per cent iron. Despite the fact that some old-style bottles contain little manganese and are clear, an abundance of purple glass at a mining camp nevertheless suggests a pre-World War I date because so much of the utility glass of that era contains enough manganese to produce the color.

Bottle glass at old mine camps also is likely to have its surface corroded; some surfaces are beautifully iridescent. This property of old utility glass resulted from excessive alkalis, especially sodium (Morey, 1925, p. 392), in the mix. Most of the utility glassware at old mine camps is known as soda-lime glass and is a mixture of soda, lime, and silica (Morey, 1933, p. 742). Pure silica would be the most desirable material for most glass except the cost of manufacture is prohibitive because both the melting point and viscosity are high; other oxides, alkalis, are added to lower the melting point and viscosity (Morey, 1933, p. 743). Fluxes like sodium carbonate and sodium sulfate (Finn, 1938, p. 891) supply the alkalis that make melting easier but sodium especially makes the glass more susceptible to corrosion (Morey, 1925, p. 392). The alkali content in glass was not well controlled until machine methods were adopted, and glass at old camps is likely to have corroded and iridescent surfaces.

The history of changing styles in tin cans and bottles has an interest all its own, for those who would pursue the subject more deeply, a bibliography is added.

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I. C. WHITE *(Continued from page 13)*

states of Brazil, South America. For this purpose the position of Chief of the Brazilian Coal Commission was offered in 1904 and accepted by Dr. White and held by him until 1906. He made two trips to southern Brazil, one in 1904, and the other in 1905, spending several months in the field on each trip, largely in the wild and inaccessible regions of that country. His purpose was to ascertain the extent and character of the coal beds and the quality of the coal. His final report in a single volume, printed page by page in both English and Portuguese, was published in 1908.

Dr. White was a charter member of the Geological Society of America, serving as its treasurer from 1892 to 1907, and as its president in 1920. He was also a charter member of the American Association of Petroleum Geologists and served as its president for one year (1919-20). Other memberships in scientific organizations were in the American Association for the Advancement of Science, serving as vice president of Section E (Geology) in 1906-07; the Association of American State Geologists, being its president in 1913-15; the American Institute of Mining and Metallurgical Engineers; The American Mining Congress and the Natural Gas Association of America. In almost all these organizations he took an active part. He was a delegate from the Geological Society of America to the International Geologic Congress in St. Petersburg, Russia, in 1897, and again at Paris, France, in 1900.

In spite of his active scientific life, Dr. White found time to devote to civic affairs and business activities. He was a leader in any field commanding his attention. His home town and state have enshrined him as one of their immortals—He died Nov. 25, 1927.

Dr. White's life work was the intensive study of the structure and resources of the Appalachian province centering in West Virginia, and the economic geology of the carbon minerals. His writings on these subjects numbering many score of volumes and pamphlets show the intensity and completeness of his work. Outside his special field of Appalachian stratigraphy and occurrence of the hydrocarbons, he wrote but little. He was caught and held in the maelstrom of a great development in industrial geology.

Had he been minded to neglect his science and enter public service, possibly he might have had any office in the gift of his State. He had mental poise, excellent judgment and far vision, with energy and modest self-assertion, united to high ideals and integrity. This would have made him a success in any public field; but the devious ways of politics did not accord with his sincerity and devotion to truth. Not that he loved West Virginia less, but that he loved his scientific work and fellowships more, held him in his chosen field.

DANIEL A. BUSCH MATSON AWARD WINNER

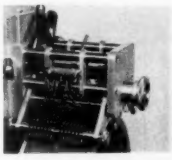
The 1959 Matson Award Committee of the American Association of Petroleum Geologists headed by Frederic H. Lahee voted unanimously in selecting Dr. Daniel A. Busch, Tulsa consulting petroleum geologist, as the winner of the Matson Award in recognition of his excellent presentation of the paper *"Prospecting for Stratigraphic Traps"* at the 44th annual meeting in Dallas, Texas, March 1959.

The award, named in honor of George C. Matson, fifth president of the AAPG, was awarded for the third time. Previous winners were John A. Masters (1957) and James W. Gwinn (1958).

Panhandle Field Trip

The Panhandle Geological Society is sponsoring a field conference May 20-23 in the Southern Sangre de Cristo Mountains and basinal areas of northeastern New Mexico. The field trip will begin at Santa Fe and terminate at Cimarron. The conference will concentrate on Pennsylvanian and Permian lithofacies and related petroleum exploration developments. The field excursions plans are under the direction of *W. M. Quackenbush, General Chairman.*

You saw it in GeoTimes . . .



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Popular Geology in Print

by Mark W. Pangborn, Jr.

Rockhounds will appreciate the second edition of *Russell P. Macfall's* GEM HUNTER'S GUIDE (Science and Mechanics Publ. Co., 450 E. Ohio St., Chicago 11, Ill., 1958, $3.95); the most valuable part of this book is an up-to-date list of about 1000 collecting localities, with good maps and a bibliography of useful handbooks and regional guides. For the same audience is the misnamed ROCKHUNTER'S FIELD MANUAL, by *D. K. Fritzen* (Harper, 1959, $3.50), which consists mainly of a recognition key to 126 common minerals, grouped according to color, and within each color arranged alphabetically, of all things! The earnest collector will certainly prefer the tightly-organized keys in, say, *David E. Jensen's* new edition of *English's* GETTING ACQUAINTED WITH MINERALS or in *Krauss's* MINERALOGY.

Michael Weinstein's THE WORLD OF JEWEL STONES (Sheridan House, 1958, $10) is an expert survey of the gem minerals, aimed at the general reader and a little less of a reference book than *G. F. H. Smith's* GEMSTONES. Half of this informative volume's 430 pages describe the chief gems, and the remainder covers properties, identification, imitations, cutting, and especially valuation; good bibliography. Some of the same information is presented in GEM MATERIALS DATA BOOK by *Charles J. Parsons* and *E. J. Soukup* (Gems & Minerals, P.O. Box 687, Mentone, Calif., 1957, $2); 32 pages of tables concisely summarize the properties of gem minerals, with emphasis on identification; well cross-indexed.

Historian *Clark C. Spence,* in his BRITISH INVESTMENTS AND THE AMERICAN MINING FRONTIER, 1860-1901 (Cornell U. Press, 1958, $4.50), for the first time summarizes the awesome problems faced by British stock companies as John Bull naively tried to cut himself in on the Western bonanzas; thoroughly documented, slyly humorous, and most interesting. Mining history fans will also enjoy *Caroline Bancroft's* GULCH OF GOLD (Sage Books, 2679 S. York St., Denver 10, Colo., 1958, $6); written around the lives of John Gregory, Mary York, the George Randolphs, and some other prominent citizens, this informal, somewhat fictionized history stresses the human aspects of the Central City boom, 1859-1879; good bibliography.

In a better-than-average company history, VEIN OF IRON (World, 1958, $4), *Walter Havighurst* traces the 75-year history of Pickands Mather & Co. from small beginnings in a wooden steamer and some Upper Michigan iron lands into the giant Great Lakes mining and shipping firm of today.

The Idiot and the Witch

A clever scheme to aid the technical department of the Tulsa Public Library is credited to Geologist Grace Hower of Amerada Petroleum Corporation who is Chairman of the Tulsa Geological Society's Committee for Library Action. To aid the public library as it has in years past, the Committee announced at a recent luncheon meeting of the T.G.S. the need for funds to maintain certain technical library subscriptions. It was announced that "*two of our more intellectual members will pass among you to accept dimes, quarters, and dollars for this worthy cause.*" Two members costumed as an idiot and a witch collected $93.40. A similar collection campaign was later sponsored by the Tulsa Geophysical Society.

You saw it in GeoTimes . . .

COPYTRON 1000 is a new compact reproduction machine that reproduces working

drawings electrostatically from 35 mm microfilm drawings for a few cents per print. More data on this machine which will be exhibited at the Tulsa Petroleum Exposition may be obtained by writing the *Charles Bruning Co., Inc., Mount Prospect, Illinois.*

RESEARCHES in GEOCHEMISTRY

Edited by PHILIP HAUGE ABELSON, *Carnegie Institution of Washington. With 25 contributors.* This book provides a comprehensive view of current research in geochemistry. Written by authorities in their respective fields, each chapter reviews (briefly) the present status of research in the area of inquiry, describes (in detail) the author's recent contributions, and contains an extensive selected bibliography. Among the contributions in this volume that make it unique in its field are: (1) a description of techniques that have been used to estimate temperatures of formation of numerous ore deposits, (2) dating methods for the study of pre-Cambrian stratigraphy which have already been successfully employed to date events occurring in the history of the earth, and (3) an important contribution to the geothermometry of silicates and carbonates. *1959. 511 pages. $11.00.*

VECTOR SPACE

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By MARTIN J. BUERGER, *Massachusetts Institute of Technology.* The author reports fully on the increased importance of using vector space as a relatively easy solution of the phase problem normally encountered in the study of the arrangement of atoms in crystals. *1959. 347 pages. $12.00.*

TIME, LIFE and MAN

The Fossil Record

By RUBEN ARTHUR STIRTON, *University of California, Berkeley.* Provides a comprehensive treatment of paleontology, outlining methods and principles. It includes a condensed classification of plants and animals; a discussion of the sequence of life and environment, and special sections on selected subjects. *1959. 558 pages. $9.00.*

GROWTH and PERFECTION of CRYSTALS

Edited by R. H. DOREMUS, B. W. ROBERTS, *and* DAVID TURNBULL; *all of the General Electric Research Laboratory.* Contains up-to-date and pertinent reports and discussions on crystal phenomena, polymer crystallization, and crystallization of simpler molecules, presented at an international conference held in New York in 1958. *1958. 609 pages. $12.50.*

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VACANCIES

MONTANA STATE UNIVERSITY, Missoula, Montana, plans to add two staff members in September, 1959. Must have Ph.D.'s; will teach average of 8 credits per quarter; research encouraged in this young, growing department. Must have backgrounds in invertebrate paleontology or mineral deposits. Will teach those courses plus some allied courses and/or beginning courses. Write Chairman, Geology Department.

DARTMOUTH COLLEGE, Hanover, N. H. Glacial geologist-geomorphologist for an opening in September, 1959. Ph.D. required. Preference to younger men. Salary and rank dependent on qualifications.

APPLICATIONS are invited for the position on the staff of the Department of Geology in the rank of Assistant Professor on the salary scale $5400-100-7000 to teach paleontology and stratigraphy. Contribution by the University up to $750 made towards moving expenses. Curriculum Vitae, a recent photograph and the names of three referees should accompany the application to the President of Memorial University of Newfoundland, St. John's Newfoundland.

ANTARCTIC POSITIONS in traverse geophysics and glaciology for austral summers 1959-1960, 1960-1961, and austral winter 1960. Salary range: $6,000 to $10,000 plus isolation allowance, food, clothing. Applications considered through June 1959. Send education and experience resume to: U. S. Antarctic Research Program, Arctic Institute of North America, 1530 P Street, N.W., Washington 5, D. C. Attention: R. W. Mason.

CAPITAL UNIVERSITY, Columbus 9, Ohio. Teaching position beginning September 1959, full-time, undergraduate courses, especially mineralogy, economic geology, and related subjects, with some general geology-geography. Apply to Professor Ralph H. Bond, Department of Geology.

STRATIGRAPHER-PALEONTOLOGIST, Ph.D. To teach Historical, Paleontology, Stratigraphy, Structure, Field Methods. Prefer man with experience in Marine Geology for opportunities in research and teaching. Probably Assistant Professor rank. Submit qualifications to Agatin T. Abbott, Chairman, Department of Geology and Geophysics, University of Hawaii, Honolulu, Hawaii.

UNIVERSITY OF NEVADA, Reno, opening September 1959 for lecturer in paleontology, petroleum geology. One year appointment, with possible one year extension. Teaching load restricted to two courses per semester. Remainder of time collecting and curating fossils. For full details apply to: E. R. Larson, Chairman, Department of Geology.

UNIVERSITY OF MINNESOTA, Minneapolis, Minnesota. Opening in Geophysics for teaching and research at Assistant Professor level, starting Sept. 15, 1959. Desire Ph.D. with geological interests, capable of establishing program of geophysical field investigations. Contact Head, School of Mines and Metallurgy, University of Minnesota.

SEDIMENTOLOGIST, M. S. or Ph.D. with several years research experience in carbonate rock studies. Should have good background in Paleontology—Ecology.

SEDIMENTOLOGIST, M. S. or Ph.D. Specializing in clastic sedimentation. Should have several years research experience with sand-shale sedimentation characteristics. Experience with modern sediments and ecology desirable.

Individuals will be responsible for research projects in their respective fields. The primary emphasis will be on interpretation of sedimentary environments as related to stratigraphic traps. Each man will participate in equipping a laboratory and specifying supplemental personnel for a newly established geological research section. Across to electron microscope, X-ray unit, mass spec and other facilities. Prefer men familiar with petroleum operations.

Reply to:

Mr. John M. Crawford, Director
Exploration Research Division
Research and Development Department
Continental Oil Company
Ponca City, Oklahoma

THE DEPARTMENT OF GEOLOGY, University of Alberta, invites applications for the following position: Geologist, Ph.D. appointment at Assistant Professor Level with salary dependent on qualifications and experience, to organize and head a geological department in the University of Alberta at Calgary, duties to commence September, 1959. Applications, supported by transcripts and letters of recommendation, should be addressed to the Chairman, Department of Geology, University of Alberta, Edmonton, Alberta.

POSITIONS WANTED

BOX 398. WHO NEEDS A 29 year old, married exploration geologist with varied mineral deposit experience who can write? Has written articles and reports for all levels of geological interest and knowledge. Open to any attractive offer.

BOX 481. RESEARCH PETROLEUM GEOLOGIST-STRATIGRAPHER, 30, M.S. Extensive experience in most provinces U.S. and Canada. Have utilized newer exploration tools; Entropy Lithofacies mapping, Gamma-Halo surveys, porosity maps, moment maps, etc. Desire position of responsibility in research or exploration. Executive ability.

BOX 483. PETROLEUM-GEOLOGIST, M.S. 30. Diversified experience; subsurface, research, teaching. Knowledge of Texas, mid-cont., Rocky Mts., Appalachian, Canada. Creative thinker, aggressive, proven oil finder, capable of organizing or operating exploration or research group. Desire domestic or foreign position of responsibility.

BOX 536. GEOLOGIST, Ph.D., 30, family, desires teaching and research position in college or university, or research work with petroleum company. Principal fields micropaleontology and stratigraphy. Also proficient in sedimentology and petrography. Industrial and teaching experience.

BOX 547. GEOCHEMIST-MINERALOGIST, Ph.D., 34, married. Desires academic position, preferably one that combines teaching and research. Interested in crystal chemistry, phase rule, and synthetic mineralogy. Experienced in experimental geochemistry, microscopy, and x-ray diffraction. Publications.

POSITIONS WANTED—*Continued*

BOX 552. GEOLOGIST, Ph.D., 34, married. Desires permanent teaching position in small to moderate size school and town, preferably in south or west. Broad geological background in teaching and research, especially in sedimentary rocks, principles of stratigraphy, petroleum geology, and mineralogy. Presently employed as geologist by major oil company.

BOX 559. GEOLOGIST, M.Sc., 6 yrs. experience, West Texas, Venezuela and Libya; interested in electric log analysis and interpretation, facies studies. U. S. G. S. rating G-11, will travel; excellent references. Interested in petroleum industry and/or teaching.

Box 577. GEOPHYSICIST, B.S. in Geophysics. Five and one-half years diversified experience in seismic computing and interpretation. Desire responsible work in geophysical interpretation. Willing to work anywhere, including foreign. Presently employed.

Box 585. GEOLOGIST, experienced explorationist with diversified background in the Four Corners, Panhandle and Permian Basin. Previous work includes sub-surface, supervision and seismograph.

Box 586. GEOLOGIST, Ph.D., 35, married, background in Pleistocene geology, geomorphology, pedology, clay mineralogy, petroleum geology. Desires research and/or teaching.

Box 593. GEOLOGIST, B.S., MINERALOGIST, M.S. in June. Desires position with mining company, oil company, or commercial laboratory. Any location. Resume sent on request.

Box 594. PALEONTOLOGIST - GEOLOGIST, M.S., 27, married. Two years experience in micropaleontology and stratigraphy. Desires foreign position. Resume on request.

Box 597. ASSISTANT PROFESSOR, 32, Ph.D., married. 6½ years teaching experience at large eastern university; courses taught include undergraduate mineralogy and petrology, graduate metamorphic petrology and volcanology. Presently hold NSF fellowship. Interested in teaching similar courses at some western school; heavy teaching load no objection.

Box 599. MINING GEOLOGIST, B.S., Univ. of Mo., year of graduate study Univ. of Colo., 8 years extensive experience western U.S. and Africa in metallics, nuclear fuels, some nonmet., familiar with geochemical, geophysical, airborne exploration methods, project coordination, laboratory investigative procedures, mining methods. Special interest in geophysics. Directed geological departments of 3 private companies. Desire location or base of operations in U.S. Available immediately.

Box 601, GEOLOGIST, with business training, 33, single, M.S., 1 year geology instructor, 6 years experience. 1 year business school at university, some sales experience. Veteran. Interested in diversified firm, domestic and/or foreign.

Box 602. LIBRARIAN with teaching and research experience in biology and paleontology, seeks librarian or documentation position with research opportunities; west preferred.

Box 603. MINING GEOLOGIST-EXPLORATION ENGINEER; Ph.D. level education and registered professional engineer seeks more challenging and responsible position in industrial or consulting organization where creative thinking, initiative, competence, and resourcefulness are appreciated. Diversified experience in field and mining geology, exploration, and property evaluation, plus related supervision, administration, and mining law background. Veteran, late 30's, family. Employed; available 1 to 2 months.

Box 604. GEOLOGIST, M.S., 26, single, four years experience with major oil company. Desire position preferably in paleontology, but will consider any type work either temporary or permanent. Complete resume furnished on request.

Box 605. GEOLOGIST, Ph.D., 38, training in mining and petroleum geology, with 14 years field experience in Pleistocene geology and alpine and Polar glaciology. Holds both American and European geological degrees. Desires position in teaching or administration/research. Excellent references. Resume on request.

Box 606. GEOLOGIST, M.S. (1955), 31, married, urgently desires permanent domestic position in the fields of either petroleum geology, mineral industry, geologic survey work, or teaching. Good references and academic record. Graduate work in hardrock geology and petrographic microscope. Some professional experience with U.S.G.S. Three years employment by major petroleum company overseas, surface and subsurface. Resume on request. Will appreciate interview opportunity.

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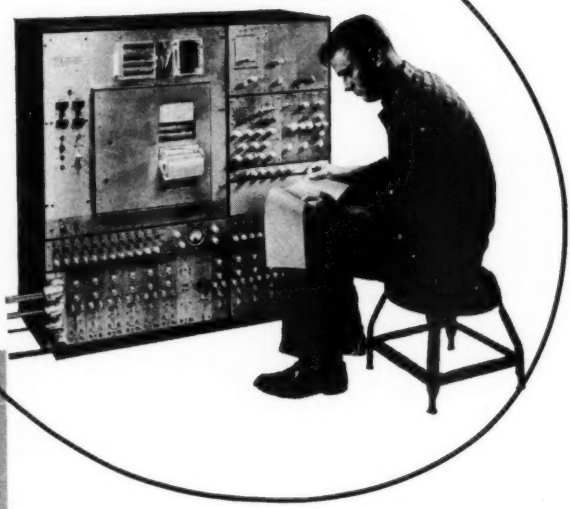

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